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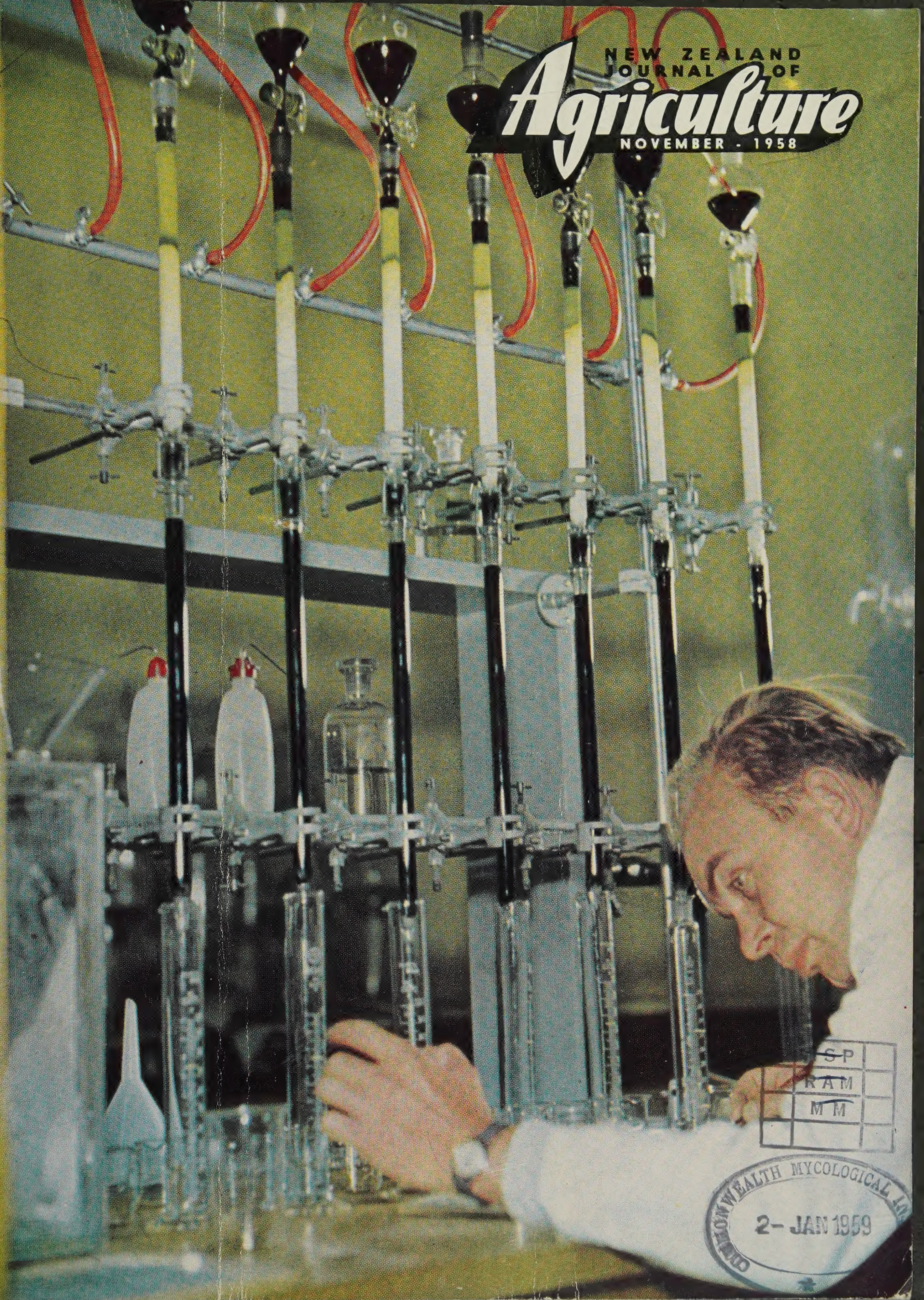

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Number 5
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1958

NEW ZEALAND JOURNAL OF Agriculture

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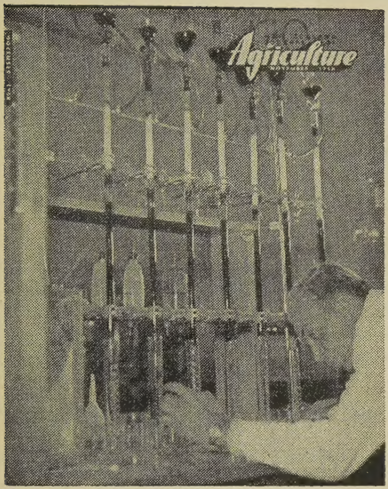

"Science with Practice" was the motto adopted by the Royal Agricultural Society of England when it was established in 1837. In agricultural improvement since then, the research worker's contribution has been an ever-increasing one. It has been particularly important in New Zealand and the solutions of many soil and animal problems have been found in the laboratories of agricultural research institutions. Our cover, from a photograph taken at the Department of Agriculture's Ruakura Animal Research Station, shows the "beaker testing" of toxic pasture extracts in the search for the cause of facial eczema in livestock.

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HIGHEST DEATH RATE ON RECORD

33 Tractor Fatalities in 1957

TRACTOR fatalities in 1957 reached the highest total so far recorded—33. There have been 169 deaths due to tractor accidents since January 1949, when Department of Agriculture records were begun. Most of the fatal accidents had simple causes and could have been prevented by a little care. This article by C. J. Crosbie, Machinery Instructor, Department of Agriculture, Christchurch, describes events leading to fatalities. It is hoped that operators by studying these facts will be able to avoid mistakes that have led to deaths of tractor drivers.

IN addition to the 33 fatalities last year, there were 15 serious tractor accidents in which the drivers lost arms, broke bones, or were otherwise badly injured. Some have been permanently incapacitated and have had to change their occupations. The fatality rate per 100,000 tractors, which had been falling steadily in the previous 4 years, rose in 1957 to 46.5, which was exceeded only by the 1952 figure of 54.8.

A more complete scheme of collecting field data and their analysis on a card index system now reveals more details of a most important nature: the far-reaching social and economic consequences of tractor fatalities:

	Deaths
Farmers	16
Farmers' sons or daughters	6
Contractors	4
Tractor drivers	5
Farm hands	2
	33

This table shows that of last year's tractor fatalities, two-thirds were losses from farming families, which New Zealand can ill afford. Contractors, because they are in the main expert tractor drivers, are often engaged in difficult or hazardous work; even they can make fatal mistakes—4 last year. Five full-time tractor drivers lost their lives last year. Of the two general farm hands one was a learner driver.

As a result of last year's tractor fatalities there are 17 widows and 36 children who have lost their fathers and in consequence may not be able to get the financial assistance for education and personal guidance that they would otherwise have had.

AGES OF PERSONS KILLED BY TRACTORS

Age	No.	Age	No.
Up to 14 ..	4	41-50	9
15-20	5	51-50	4
21-30	4	61-70	1
31-40	5	Over 70 ..	1

Despite repeated warnings about the extreme folly of allowing children to ride on tractors, four children, 4, 4, 5, and 6 years old respectively, were killed in tractor accidents in 1957. As in the past the greatest number of victims were in the 21-50 age group, which includes the majority of men driving farm tractors. Of the 6 drivers over 50 the eldest was 76. Tractor driving is not an occupation for a man whose reactions are slowing down.

GRADES OF LAND ON WHICH FATALITIES OCCURRED

Flat and slightly rolling (0-9 degrees)	19
Moderately steep (10-19 degrees) ..	5
Steep (20-29 degrees)	6
Very steep (30 degrees or more) ..	3
	33

In about two-thirds of all the fatal accidents the tractors were working on flat or nearly flat country just before the accident occurred. This conforms to the pattern noted in previous years.

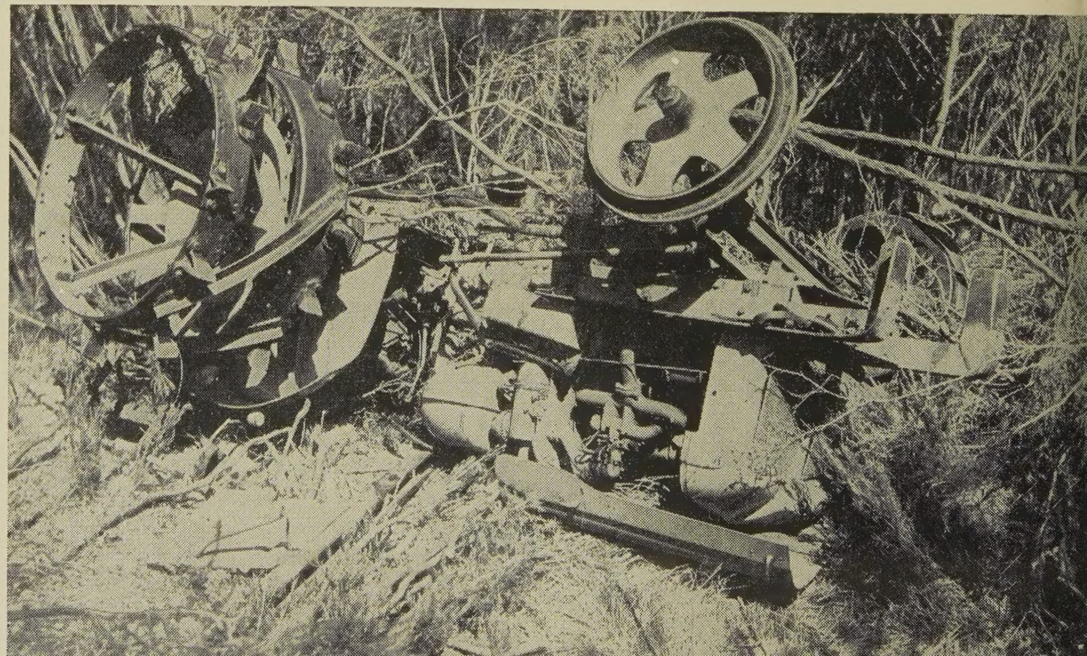
ANALYSIS OF CAUSES OF FATALITIES

6 crawlers	1 somersaulted backward 4 rolled over 1 bulldozer blade accident
27 wheeled tractors	3 somersaulted forward 1 somersaulted backward 15 rolled over 4 crushed victims 2 victims fell off 1 killed by rotary hoe blades 1 killed by power take-off shaft

Case Histories

Case histories of 24 of the 33 fatalities follow. The special circumstances are given in these instances to emphasise pitfalls so that readers can be forewarned. For the other 9 accidents causes only are given.

In 19 of the 33 → fatal accidents with tractors in 1957 the tractors rolled over. This one was being used for crushing scrub when it went over a concealed steep face, rolled over, and crushed the driver.



Crawler Tractors

Somersault Backward

1. A 14-year-old boy was driving a crawler tractor with his 4-year-old brother sitting on the seat in front of him. On the way he had the choice of two routes, to the left or right of a steep knoll. He first chose the left one, but at the last moment changed his mind and turned right. The tractor when faced up the steep knoll somersaulted backward, the younger boy being crushed under it. The driver fell between the tracks and the motor and was unhurt.

Rolled Over

2. With a single-furrow semi-swamp plough a driver was ploughing out of the rough on a steep sideling with a slope of 27 degrees. To avoid a difficult patch he pulled the plough out and moved up hill. He swung the tractor back and while he was manoeuvring to drop the plough in the furrow the tractor slipped sideways and rolled completely over as it fell over a 30 ft. drop. The driver was thrown clear, but the tractor moved forward and dragged the plough over him, inflicting fatal injuries.

3. A crawler with a bulk-lime top-dresser rolled over.

4. & **5.** Two drivers were killed when they were root-raking or blading scrub into gullies. In both cases they had taken a blade of scrub and soil into the gully and were unable to reverse back up its steep, greasy side. Accordingly, intending to drive up the gully, they moved up on to the heap of soil and manuka, and turned hard left. At this stage the heap collapsed under the right track and the crawlers rolled over upside down to crush the drivers.

Bulldozer Blade Accident

6. Owing to its being difficult to start with the battery, a bulldozer with a winch-operated blade was parked at night facing downhill. Its blade was up. It was started by engaging a gear and running it forward. It was windy next morning when the driver partially undid the cover over the seat and then moved forward to investigate an oil leak under the nose of the crawler. The blade fell, killing him. It is fairly certain that the cover or one of its ropes became entangled in the release lever operating the winch and the wind force was strong enough to trip it from the hold position. Not much pressure was required and there was no attachment to secure the lever in the locked position.

Wheeled Tractors

Somersault Forward

7. A careful, experienced driver who had done this work in the previous season was consolidating a silage clamp by driving his tractor up the slope and reversing down. On this occasion he drove straight on over the top of the wedge, his machine somersaulting forward and falling 14 ft. It landed on its radiator and toppled forward to pin and kill the driver.

8. A tractor somersaulted over a creek bank during ploughing.

9. A land girl driving a tractor fitted with a front-end loader and towing a trailer came out of a field through a gate and was turning left on to a road

Watch These

CERTAIN types of tractor accidents causing death have tended to recur, but other mishaps reveal perhaps little-realised dangers. Trends in recent years indicate that drivers as a whole do not appreciate the dangers associated with the following practices.

HIGH HITCHING

Three drivers have been killed and two hospitalised in recent years through the high hitching of heavy loads. When a load is attached to the tractor above the normal drawbar—to the back axle, seat standard, or top hitch of the 3-point linkage—forces set up can result in a backward somersault. Even hitching high under the gearbox can have the same result.

Loads should be hitched only to the standard drawbar.

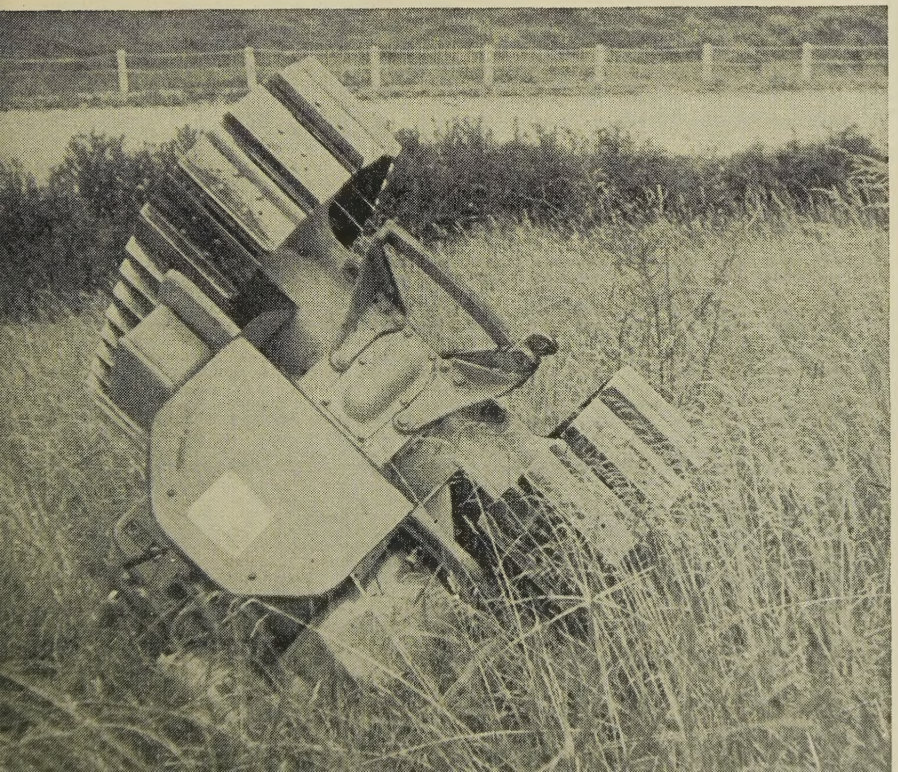
DRIVING ON ROADS

Some modern tractors can attain speeds in excess of 20 m.p.h. Driving on metal roads at this speed is dangerous, because farm tractors are unsprung and not capable of absorbing the shock of hitting ruts and potholes at such speed. Steering control may be lost and if the machine passes off the road over a bank only 3 ft. high or up the side of a cutting at speed, it will either somersault or roll over.

There has been an increase in deaths of tractor drivers on roads or bulldozed farm tracks. Farm roads are often bulldozed on very steep country and there is no hope of the driver recovering control if the machine leaves the road. Much more care in road driving is necessary.

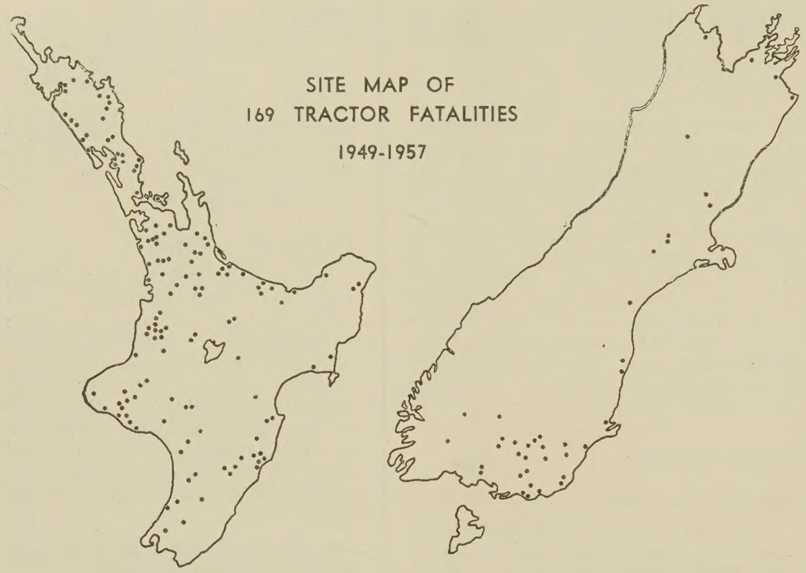
BULLDOZING SCRUB

Case histories 4 and 5 showed that two experienced contractors were killed when their tractors rolled over owing to a new fill of soil and scrub collapsing under one track of a crawler. Contractors should heed this warning.



← This tractor somersaulted backward and killed the driver when he drove up a slight slope but met a short, steep part about 3 ft. high.

TRACTOR FATALITIES IN 1957



The wide dissimilarity in numbers of tractor fatalities in the Auckland and Canterbury districts (8 : 1) is felt to be more closely linked to the human factor than to tractor numbers or land form. In the immediate pre-war years the latter area had about 70 per cent more tractors than did Auckland. Just after the war the numbers of tractors in the two areas were equal. Last year there were about 10,500 more tractors in Auckland (due mainly to the large number of small machines bought for small dairy farms after the war) and the ratio now is about 1¾ : 1 in Auckland's favour. This, however, does not fully account for the 8 : 1 fatality ratio.

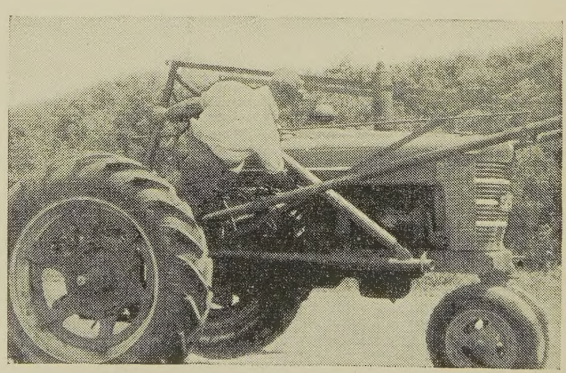
Canterbury has a large area of flat land whereas farming areas in Auckland generally are steeper, but this difference does not explain the 8 : 1 ratio in fatalities, because of the 169 tractors involved in fatalities from 1949 to 1957, 60 per cent were working on flat or nearly flat fields. However, it does appear that flat fields in the North Island are closely bounded by more hazards to tractors than those in the South Island, where flat fields are more likely to abut other flat fields.

Tractor population in the Auckland area has become markedly large only since the war and the majority of drivers have been associated with tractors for less than 10 years. Many drivers in the South Island have had a much longer association with tractors, and it is felt that their inherent respect for their machines (or lack of that respect elsewhere) does much to explain the 8 : 1 fatality ratio between the Auckland and Canterbury districts.

and a small bridge when the front-end loader struck the far side of the bridge. She lost control and the tractor somersaulted forward over the edge of the bridge, falling 17 ft. into a gravelly stream about 2 ft. deep. The girl was killed instantly.

Somersault Backward

10. When he was summonsed to aid a bogged tractor the driver of a rubber-tyred tractor fitted with grippers hitched a length of heavy chain to the front axle of the bogged tractor and to the top hitch of the 3-point linkage of his own machine. In second gear he stalled his tractor; then in low gear at full throttle he suddenly engaged the clutch and the tractor somersaulted backward. The driver received severe injuries from which he died on his way to hospital.



Reconstruction of a fatal accident: A driver travelling on the road in top gear attempted to change over the fuel cocks. He was thrown to the tar-sealed roadway by the right rear wheel cleats and his skull was fractured.

Rolled Over

As in past years the greatest number of drivers lost their lives when tractors rolled over on them. The wide variety of situations in which tractors will roll over is shown in the following cases.

11. A man was riding on a platform built behind the driver's seat and feeding fertiliser into a spinner topdresser fitted on the rear of a wheeled tractor. The unit was being driven round the contour of a slope of a general grade of 1 in 5 or 6 when the rear wheels slipped on some old battens that had been laid out up and down the slope and had become hidden in the grass. The tractor slid sideways and surface irregularities and the high topweight of 7 bags of fertiliser caused it to roll over several times for 70 ft. The man on the back of the tractor died from injuries received. The driver was uninjured.

12. Tractor rolled over when a steep sideling was being topdressed.

13. A farmer had completed mowing a flat paddock, but instead of taking the usual way up a formed track, he drove straight up a steep, danthonia-covered slope (1 in 2). When he got about 1½ chains up the slope the wheels skidded and he could go no further. He therefore turned left and then downhill, but skidding wheels could not slow the tractor. It veered left and when nearly straight across the slope, rolled over several times for 53 ft., coming to rest against a fence post minus a rear wheel and several parts. The driver's chest was crushed in the first roll.

14. Tractor rolled upside down when tedding hay.

15. Tractor rolled completed over when it was turning on sideling.

16. A farmer driving a tractor out of a gateway turned left on to a 15 ft.-wide road, but swung too wide and the tractor rolled over on a steep slope above a culvert on the right side of the road and killed the driver. A bump of shingle may have caused some unsteadiness. The culvert was not fenced or protected.

17. A tractor towing a trailer overturned on an 18-degree hillside.

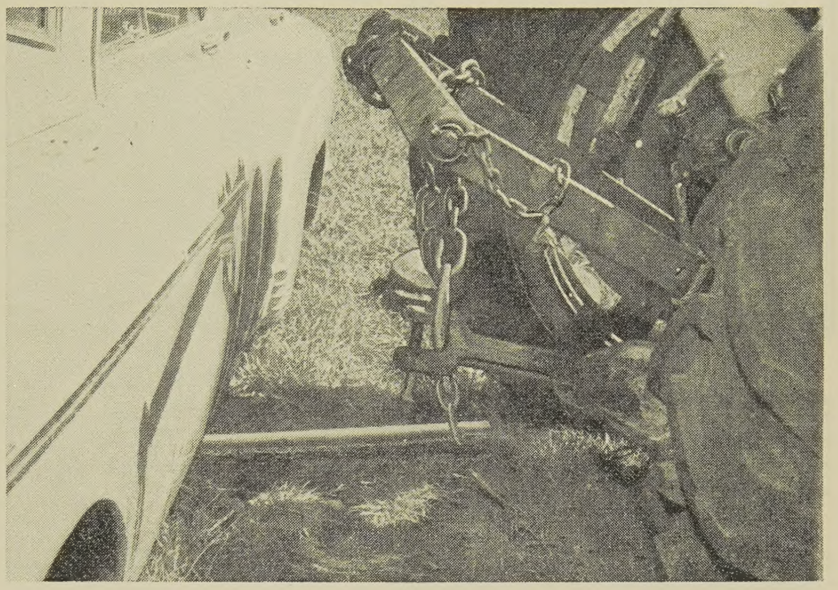
18. While spraying weeds along the edge of a well defined terrace a farmer drove on to a 25 degree slope which fell to a stream 20 ft. below. The tractor skidded sideways for 7 ft., hit a bump, and rolled over, landing in the stream upside down. The driver was pinned under the tractor and drowned in 4 ft. of water.

19. A tractor was being driven home about ¼ mile from a neighbour's house about midnight. It was heard to pass another house with the motor revving higher than usual. An hour later the driver was found pinned by the neck under the overturned tractor. The left-hand front wheel had mounted a small bank on the left of the road and had travelled along the bank, which increased in height, until the tractor rolled over.

20. Tractor rolled over when it failed to take a bend in a road.

21. A tractor driver died of head injuries received when a truck struck his tractor. He was driving along the road, followed at a reasonable distance by a truck, when he apparently indicated a right-hand turn into a field and turned immediately. The following truck struck the tractor and threw it on to the side of the road. It rolled over completely and back on to its wheels. The truck also overturned, but the driver was not seriously injured.

22. With a tractor and mounted grader blade an elderly farmer was doing maintenance to a farm road to give access for lime trucks. He reversed the tractor too far and one rear wheel was driven over the edge of the road where there was a 4 ft. drop. The tractor rolled over and he was pinned under a mudguard. A boy who was working with him was unable to get him out with a spade, so ran 1½ miles to telephone for assistance, but the farmer was dead when help arrived.



[*"Auckland Star"*

A farmer was crushed under this car when the chain slipped off the iron bar being used with the tractor hydraulic system as an improvised jack to lift the car (see case history 26).

23. Tractor rolled upside down when it was driven on to a bank which became increasingly steep.

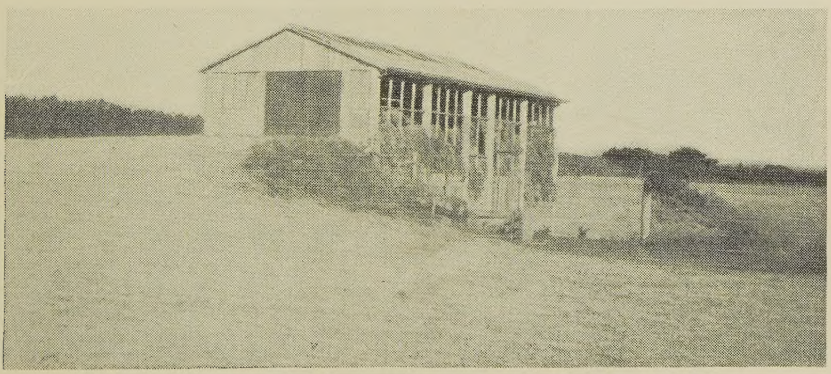
24. A farmer was killed when his tractor rolled over while he was pulling tree limbs with a 100 ft. wire rope to clear them from power lines. He had taken a pull with his tractor on a hillside off square from the line of pull. The tractor slid sideways into a rut on a slope of 22 degrees where, because it could not slide further and because of the upward and sideways pull of the rope, the tractor rolled over. The seat pinned the driver at the back of his head. He was standing at the time of the accident and not in a position to declutch the tractor.

25. A tractor driver who invariably stopped his tractor by making a sharp turn and bringing it to a sliding halt drove at high speed across a neighbour's flat field, where he was to assist in haymaking operations, and turned sharply. The tractor did not slide, as the outer rear wheel dug into the peaty soil, but rolled upside down, injuring the driver who died in hospital shortly after.

Crushed

26. To enable him to paint the underside of his car a man placed an iron bar in the jack tube and backed his three-point linkage tractor up to the car. He used an iron chain to connect the bar to the hydraulic lift arm and in this way was easily able to lift the car. He removed both wheels from the raised side and was able to paint under the car. It appears that while he was in a sitting position the chain slipped off the end of the bar and allowed the car to fall on him, pinning him across both thighs and by one wrist. He was found dead 3 or 4 days later.

27. A driver was crushed by a branch of a tree being towed clear of a fence.



A 16-year-old learner driver failed to stop his tractor when sweeping hay toward the top doorway of this shed having two-level access. It somersaulted forward, falling 14 ft. and crushing him.

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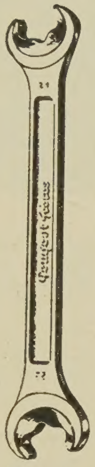

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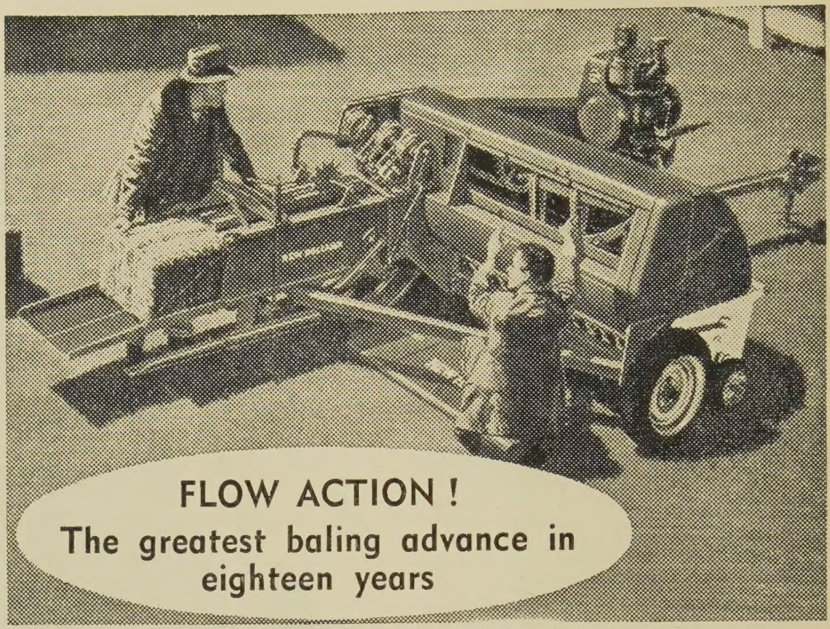

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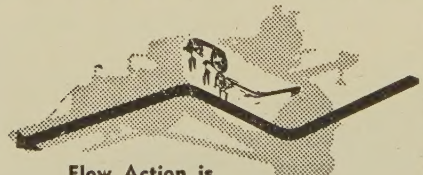

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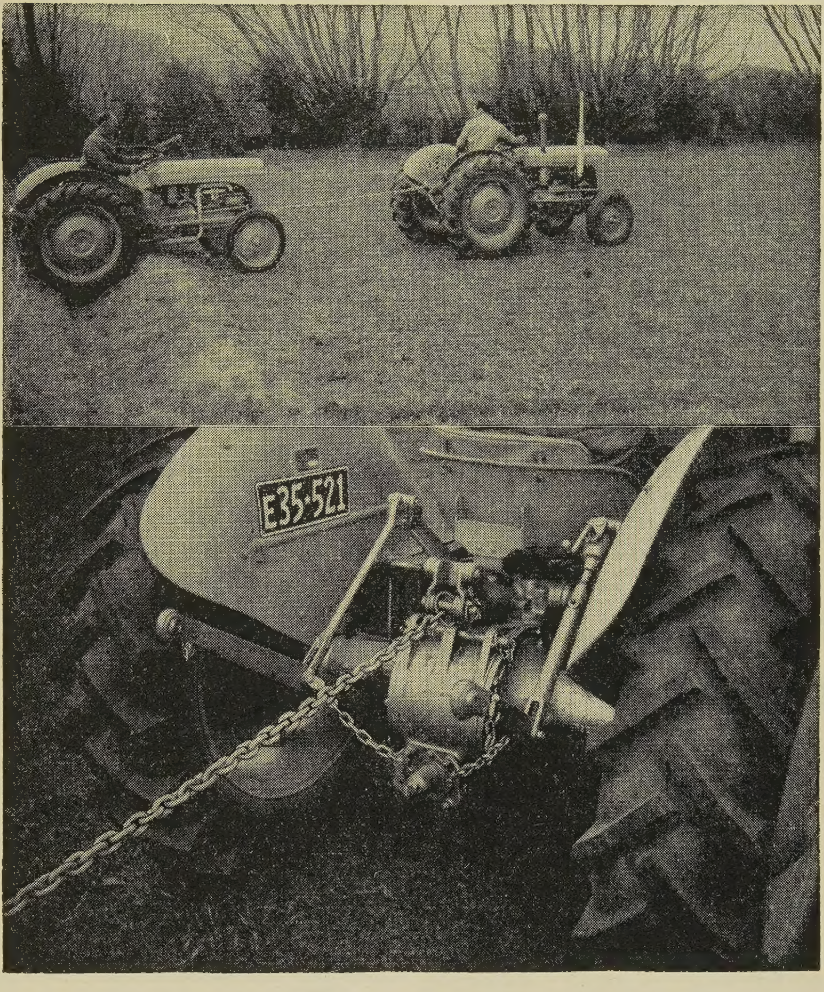
28. A tractor and trailer had been left hard up against a milk stand. It is believed that a 6-year-old boy who was playing with companions managed to start the tractor and move it forward up a slight grade. When he dismounted and moved back behind the trailer the units ran back and he was crushed between the trailer and the milk stand.

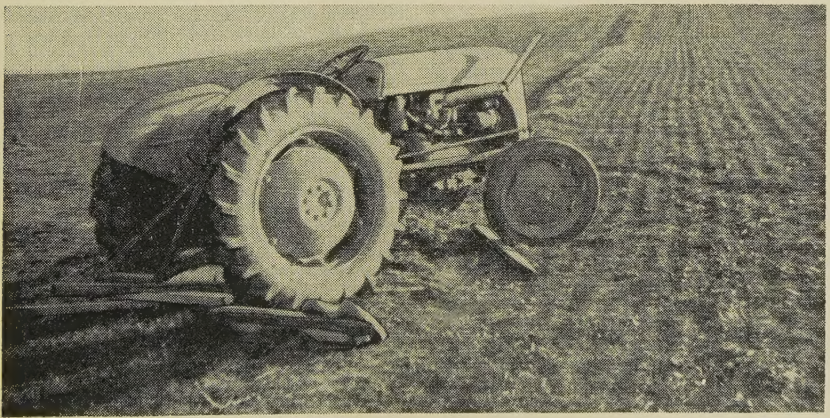
29. A 10-year-old boy backed a tractor against a concrete ramp and filled with water a can tied to the drawbar. As he started to drive away a 5-year-old boy standing on the ramp pushed against the can, and as the tractor drove away he fell down behind the tractor. As he fell his weight shifted the can a little on the drawbar. The boy driving saw the can shift and, thinking it was going to fall, declutched. The tractor ran back down the slope, crushing the 5-year-old boy against the face of the ramp.

Fell Off

30. A 4-year-old boy was sitting on one of two 44-gallon drums of water on a platform at the rear of a tractor that were used as a counterweight to a front-end loader. With a load of soil the tractor was being reversed down a slight slope. When the clutch was depressed the tractor (with which the driver was unfamiliar) continued to run back. The driver selected a forward gear and suddenly engaged the clutch. With the resultant jerk the boy fell backward and a drum of water overbalanced and fell on his head, killing him. The drums, which were normally used during weed spraying, rested on a platform with a 2 in. ledge, **but were not fixed to the tractor.**



The danger of high hitching as demonstrated here is not fully realised. In 1957 it was the cause of three deaths and serious injury to two drivers. If a heavy pull is taken from any position above the normal drawbar, there is a grave risk of the tractor somersaulting.



The driver of this tractor was killed when it rolled over at speed when going down a long, slight slope. The comparatively light damage to the tractor was repaired for £15.

31. After 3 a.m. on a cold and showery night a man was travelling home by road on his tractor at high speed. He approached downhill a sharp, well banked, right-hand corner. He grazed the inside bank and then proceeded straight ahead across the gravel road on to the left-hand grass verge. He managed to steer right parallel to the fence for about ¾ chain and then regained the road, but crashed into a bank on the right side. As the tractor swung back to the road the driver was thrown off on to the road, where he was found dead some 3 hours later. Death had resulted from injuries and exposure.

Power Take-off Shaft

32. A farmer was attending to a pump driven by a power take-off which was delivering into a spray irrigation system. Apparently he was making adjustments to the outlet valve when a loose-fitting garment was blown on to the **unguarded** shaft. He was caught up and fatally injured.

Rotary Hoe Blades

33. A contractor was rotary hoeing a small section which was marked out with strong cord. This cord became entangled in the machine and tightly bound round the shaft and outside the hoe blades. He stopped the tractor, lifted the hoe just clear of the soil, and dismounted, leaving the hoe in motion. He appears to have tried to kick the cord clear. Either his boot or trouser cuff became entangled and he was drawn on to the revolving blades, receiving injuries from which he died in hospital 1½ hours later.

Warnings Apparently Unheeded

Though a great deal of publicity has been given to warning farmers about elementary but potentially fatal mistakes, these are still being repeated: Young children continue to ride on and play near tractors, power take-off shafts remain unguarded, and drivers are still failing to observe constant vigilance.

Too many drivers do not appreciate that tractors may roll over or somersault in small broken patches adjoining flat or easy rolling country that can be worked quite safely. They appear to develop a false sense of security when working easy fields and consequently react too slowly in an emergency.

An examination of fatalities indicates that a number of tractor drivers attempted to "ride it out" when they lost control of their machines. No doubt they hoped to prevent an accident and consequent damage to the tractor. It is quite possible that had they stepped off or jumped, they could have escaped with possibly only minor injury.

The relatively small average cost of repairs is out of all proportion to the risk to life involved in trying to avert damage to a tractor. Many of the tractors that roll over or somersault and kill their drivers receive little damage. In a recent instance where a tractor rolled over and the driver was killed the tractor was repaired for only £15.

Human Factor

Seldom have tractor fatalities been attributable to mechanical faults; the vast majority result from human failure. Drivers have died through deliberately taking risks or ignoring instructions.

The present high tractor fatality rate can be reduced considerably, because many accidents that have cost lives could easily have been averted.

- **Don't attempt risky work.**
- **Always keep alert.**
- **Don't risk your life to save the tractor—jump clear.**

* * *

Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of March:

NORTH ISLAND

November

*21 and 22 November—Egmont A. and P. at Hawera.
22 November—Rotorua A. and P. at Rotorua.
27, 28, and 29 November—Auckland A. and P. at Auckland.
*28 and 29 November—Stratford A. and P. at Stratford.

December

6 December—Helensville A. and P. at Helensville.
6 December—Kaikohe A., P., and H. at Kaikohe.
*6 December—Hauraki A. and P. at Paeroa.

January

1 January—Nuhaka A. and P. at Nuhaka.
9 and 10 January—Wairoa County A. and P. at Wairoa.
17 January—Central Hawke's Bay A. and P. at Waipukurau.
*23 and 24 January—Feilding I., A., and P. at Feilding.
28 January—Marton District A. and P. at Marton.
*30 and 31 January—Horowhenua A. and P. at Levin.
31 January—North Kaipara A. and P. at Paparoa.

February

6 and 7 February—Taumarunui District A. and P. at Taumarunui.
6 and 7 February—Rodney A. and P. at Warkworth.
7 February—Rangitikei A. and P. at Taihape.
7 February—Woodville A. and P. at Woodville.
*10 and 11 February—Dannevirke District A. and P. at Dannevirke.
11 February—Te Awamutu A., P., and H. at Te Awamutu.
13 and 14 February—Ohura A., P., H., and I. at Nihoniho.
13 and 14 February—Taranaki A. and P. at New Plymouth.
14 February—Otorohanga A. and P. at Otorohanga.
14 February—Pahiatua A. and P. at Pahiatua.
14 February—Opotiki A. and P. at Opotiki.
14 February—Hukerenui A. and P. at Hukerenui.
19 February—Matamata A. and P. at Matamata.
*20 and 21 February—Masterton A. and P. at Masterton.
20 and 21 February—Te Kuiti and District A. and P. at Te Kuiti.
20 and 21 February—Franklin A. and P. (70th Annual Show) at Pukekohe.
21 February—Waiapu P. and I. at Ruatoria.
21 February—Northern Wairoa A. and P. at Mititai.
21 February—Whakatane A. and P. (50th Jubilee) at Whakatane.
25 February—Morrinsville A. and P. at Morrinsville.
27 and 28 February—Wellington and Hutt Valley A. and P. at Trentham.
*28 February—Waimarino A., P., H., and I. at Raetihi.
28 February—Putaruru A. and P. at Putaruru.
28 February—Te Puke A. and P. at Te Puke.

March

7 March—Waiotira Junction A. and P. at Waiotira.
*7 March—Mangonui County A. and P. at Kaitaia.
7 March—Albany A. and P. at Albany.
7 March—Tauranga A. and P. at Tauranga.
21 March—Poverty Bay Autumn Carnival at Gisborne.

SOUTH ISLAND

November

21 and 22 November—Nelson A. and P. at Richmond.
22 November—Courtenay A. and P. at Kirwee.
22 November—Waimate A. and P. at Waimate.
22 November—South Otago A. and P. at Balclutha.
29 November—Motueka A. and P. at Motueka.
29 November—Tokomairiro A. and P. at Milton.

December

*2 and 3 December—Gore A. and P. at Gore.
6 December—Wyndham A. and P. at Wyndham.
6 December—Otago Peninsula A. and P. at Portobello.
*9, 10, and 11 December—Southland A. and P. (Royal Show) at Invercargill.

January

10 January—Blueskin A. and P. at Waitati.
17 January—Waikouaiti A. and P. at Waikouaiti.
24 January—Waiau A. and P. at Tuatapere.
24 January—Golden Bay A. and P. at Takaka.
24 January—Palmerston and Waihemo A. and P. at Palmerston.
27 and 28 January—Otago A. and P. at Dunedin.
31 January—Banks Peninsula A. and P. at Little River.

February

14 February—Inangahua A. and P. and Sports Association at Reefton.
*14 February—Central Otago A. and P. at Omakau.
*21 February—Maniototo A. and P. at Ranfurly.
21 February—Murchison A. and P. at Murchison.
*28 February—Kaikoura A. and P. at Kaikoura.

March

7 March—Mount Benger A. and P. at Roxburgh.
*14 March—Cheviot A. and P. at Cheviot.
14 March—Upper Clutha A. and P. at Wanaka.
14 March—Mayfield A. and P. at Mayfield.
21 March—Methven A. and P. at Methven.
*21 March—Hawarden A. and P. at Hawarden.
30 March—Strath Taieri A. and P. at Middlemarch.
30 March—Mackenzie County Highland Show at Fairlie.

* The Department of Agriculture exhibit will be staged at this show.

Ram Fairs

The following are dates and venues of ram fairs up to 24 February:

8 December—Central Hawke's Bay at Waipukurau.
11 and 12 December—Hawke's Bay at Hastings.
19 January—Wairoa at Wairoa.
19 and 20 January—Masterton at Masterton.
27 and 28 January—Feilding flock at Feilding.
5 February—Christchurch stud at Addington.
12 and 13 February—Christchurch flock at Addington.
13 February—Dannevirke at Dannevirke.
13 February—Ohura at Nihoniho.
24 February—Otago at Dunedin.

Marketing Problems and New Zealand's Economic Future

By J. V. WHITE,
Rural Economist, Department of Agriculture, Wellington

IN recent months, because of the sharp drop in produce prices, there has been some serious questioning of past production policies.

What is the use, it is asked, of increasing the production of commodities that people apparently do not want to buy?

Have we been wise in concentrating our resources along certain narrow lines even if they have been highly profitable in the past?

Is our farming sufficiently versatile to meet changing patterns of demand?

Should much more of our effort be directed toward industries other than farming?

THE series of articles which will follow dealing with aspects of this problem of marketing, with the statement on dairy problems by the Minister of Agriculture, Mr C. F. Skinner, which appeared in the September "Journal", do not provide firm answers to these and to the multitude of similar questions which can be raised; nor in fact do they attempt to do so. To draw up a plan for the future of agriculture on the basis of price trends over a relatively short period and on what must at best be highly speculative guesses about the future market prospects for some products is as dangerous as it is unwise.

All that is aimed at is an attempt to analyse some of the problems facing us to try to make them a little clearer and thus provide some light to guide our agricultural and marketing policies. Economics must take into account not only factual things such as prices and quantities but many unpredictable factors such as droughts, disease, new technical discoveries, and, above all, human decisions all too often based on emotional thinking rather than careful economic appraisal of a given situation.

Some Basic Economic Facts

There are, however, in respect to New Zealand's own particular problem a number of basic facts which are beyond serious dispute, and it would be helpful to bear them carefully in mind in any consideration of our economic problems.

1 New Zealand is a country lacking in natural resources. Basically we are a poor country. Much of our land is too mountainous to farm; much more again can be farmed only in the most extensive fashion, with consequently low productivity per acre.

2 We are lacking in mineral resources other than coal, and supplies of that are by no means extensive.

3 Our one vital natural resource is a climate which enables livestock to be fed on pasture outdoors all the year round. This not only saves expensive concentrate stock foods, but reduces labour requirements to a minimum; hence real production costs are low.

4 From these livestock we produce considerable quantities of products, the bulk of which are exported. Total production is:

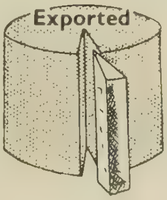
Over 500 million lb. of wool, all but about 3 per cent of which is exported,
660 thousand tons of meat, of which 60 per cent is exported,
Over 200 thousand tons of butter, about 80 per cent of which is exported,
and 85 thousand tons of cheese, of which almost 95 per cent is exported.

There are also considerable quantities of by-products from these industries, the bulk of which are exported.

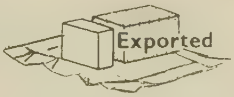
5 These exports are essential for us to import consumer goods, raw materials for industry, and capital equipment which we cannot produce locally. Imports of raw materials and capital goods are the greater part of our needs. In recent years total exports have been running at about 30 per cent of national income. As will be seen from Table 1, exports have been as high as £280 million in each of the past 2 years, but even at this level they have been barely adequate to meet the needs of a rapidly developing economy. An analysis of imports of goods in recent years shows that raw materials comprise about 51 per cent, capital goods 31 per cent, and consumer goods only 18 per cent. These figures illustrate the extreme dependence of our manufacturing industries on export earnings.

6 There is room for difference of opinion regarding the extent to which we will rely on export earnings in the future. Much depends, of course, on what living standards are postulated. Consumer goods of the luxury or semi-luxury class will, if

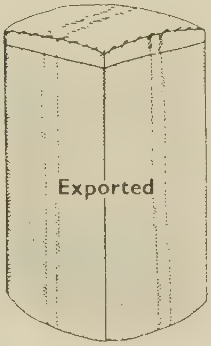
CHEESE
85,000 tons



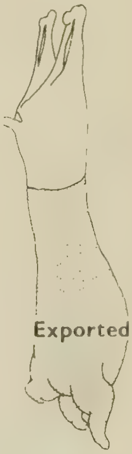
BUTTER
200,000 tons



WOOL
500 million lb



MEAT
660,000 tons



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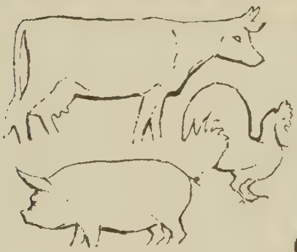

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required, in the main have to be imported for many years to come. It is possible that as local industry develops dependence on export earnings will lessen somewhat. Exports must continue, however, to be one of the major factors determining the rate of economic development and the level of living standards in this country.

7 There is much evidence to show that, broadly, export earnings must increase pro rata with population increase. If the present rate of population is maintained, this means an annual increase of from 2 to 2½ per cent a year. It is impossible to forecast whether this rate of increase will be maintained, as this will depend on levels of employment and real incomes and the consequent effects of these on birthrates and net gains (if any) from migration.

8 As far as can be ascertained at present these export earnings must come almost entirely from farm products, with some valuable but limited assistance from forest products. Export earnings from manufactured goods are hardly likely to reach large proportions within the reasonably foreseeable future.

9 The United Kingdom takes 90 per cent of our butter, 96 per cent of our cheese, 80 per cent of our meat, and 40 per cent of our wool. The population of the United Kingdom shows a very small rate of increase (about 0.36 per cent a year) largely because of a high net loss from migration, and unless consumption increases very rapidly, it cannot be expected that the United Kingdom will be able to take an ever-increasing quantity of livestock products from New Zealand.

N.Z.'s Dependence on Farm Products

The extent of New Zealand's dependence on the export of farm products is shown in Table 1 below.

Over the 3-year period for which the figures are shown butter, cheese, meat, and wool made up 84 per cent of total exports of goods, and the item "Other exports" is made up almost entirely of farm products, such as processed milk, casein, hides and skins, casings, tallow, fruit and small seeds, and peas. In 1957 timber and timber products realised £6 million.

While import payments will be lower in 1958, the substantial drop which has occurred in the prices of wool, butter, and cheese in the first 6 months of the year must inevitably mean that the deficit in our balance of payments will be greater than in 1957. The likely position in 1959 cannot at this stage be determined with any accuracy, but it is clear that unless there is a fairly substantial rise in the prices for our major exports, serious balance of payments difficulties will continue.

Ability to feed livestock on pasture outdoors all the year round is New Zealand's one vital natural resource and results in low real production costs.

Reasons for Fall in Prices

There are generally two reasons for the fall in price of any commodity: an excess of supply or a decline in demand, sometimes a mixture of the two. Both these factors are associated with the recent price falls which have so seriously affected New Zealand. With wool, which incidentally has suffered by far the most serious price fall of all our exports, the cause is a decline in demand because of the general recession which is particularly affecting some of the world's major wool-consuming countries. The elasticity of demand for wool is high, because clothing and other goods containing wool can always be made to last a little longer if money is short.

With dairy produce and to some extent meat, however, the problem is almost entirely one of oversupply, and this oversupply is caused partly by the development of synthetic substitute products such as margarine but mainly by the excess production resulting from the extensive and comprehensive systems of agricultural protectionism which have been developed in all the heavily populated industrial countries of Europe and North America. These have a two-edged effect. On the one hand, to protect the system itself restrictions are placed on the importation of farm produce frequently amounting to a complete embargo. At the same time, if production is greater than can be consumed domestically (frequently because domestic prices are maintained at too high a level),

TABLE I—OVERSEAS RECEIPTS AND PAYMENTS (£N.Z. MILLION)*

	1955	1956	1957
Receipts:			
Exports			
Butter	47.6	47.8	40.6
Cheese	17.4	20.9	14.7
Meat	58.9	70.5	70.9
Wool	93.7	98.5	108.6
Other	35.4	44.3	49.6
Total exports	253.0	282.0	284.4
Other receipts	41.1	42.3	44.2
Total receipts	294.1	324.3	328.6
Payments:			
Imports			
Government	20.7	27.1	30.5
Private	246.3	229.7	268.1
Total imports	267.0	256.8	298.6
Other payments	53.6	58.7	62.2
Total payments	320.6	315.5	360.8
Surplus or deficit	—26.5	8.9	—32.0

* Source: Reserve Bank of New Zealand

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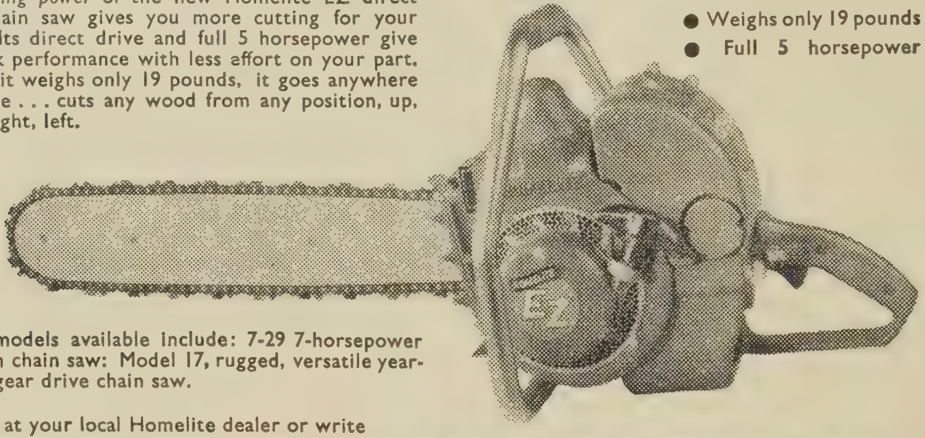

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TABLE 2—AVERAGE UNIT VALUES OF AGRICULTURAL PRODUCTS AND MANUFACTURED GOODS IN INTERNATIONAL TRADE 1913-54 AND TERMS OF TRADE (THAT IS, PURCHASING POWER OF AGRICULTURAL PRODUCTS FOR MANUFACTURED GOODS)

Period	Average unit values of all products	Average unit values of agricultural products	Average unit values of manufactured goods	Terms of trade of agricultural products for manufactured goods
	(Indices 1952-53 = 100)			
	(a)	(b)	(c)	(b/c)
1913	66	68	71	95
1920	153	148	168	88
1921-22	98	83	124	67
1923-26	99	95	112	85
1927-30	89	82	102	81
1931-34	47	38	63	60
1935-38	41	31	50	68
1947-49	95	90	97	93
1950-51	96	103	92	112
1952-53	100	100	100	100
1954-55 (provisional)	96	97	97	100

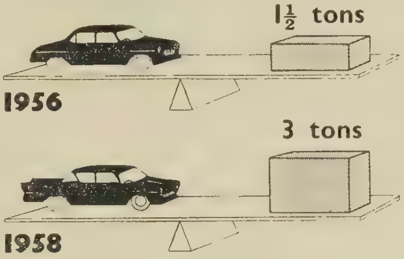
produce surplus to requirements is disposed of on overseas markets in a manner which must have the effect of destroying ordinary commercial trade.

On the surface these two sets of causes of the fall in commodity prices appear to be fairly distinct and to some extent they are. The extensive system of agricultural support operating today in the United Kingdom, for example, had its genesis in the Second World War, when it was essential that the United Kingdom be as self-sufficient as possible in food supplies, and it is at least partly for strategic reasons that the philosophy of agricultural protectionism has continued to receive the blessing of the two major political parties in the United Kingdom. Historically, however, there is a close association between the effects of economic depression on primary producers and the development of schemes of price guarantee and support for agriculture.

Relative Position of Agriculture

Practically ever since the Industrial Revolution there has been a tendency for the proportion of the national income going to the agricultural sector to decline both as a total and on a per head basis. There are a number of reasons for this, but the main one is the extreme inelasticity of demand for and supply of most farm products. This is particularly true of livestock products where there is a long biological cycle in the production process. On the demand side the proposition can be most simply expressed by stating that while human wants are infinite there is nevertheless a limit to the capacity of the human stomach. This is particularly true of basic cereals such as wheat and rice, for which the consumption range is strictly limited and can be measured with a fair amount of precision.

The inelasticity of demand and supply in respect of agricultural products is illustrated by figures showing the movement in terms of trade. The concept of terms of trade is a complex one. It can best be described as an attempt to measure the relative movements in purchasing power as between any two commodities or any two groups of commodities. As an example, 2 years ago about 1½ tons of butter would have realised sufficient overseas funds to pay the landed cost of an average-sized motorcar; at the time of writing (July 1958) it would need nearly 3 tons. Hence the terms of trade for butter in terms of motorcars had deteriorated by some 50 per cent.



It can therefore be seen that terms of trade can measure relative price movements only from some given point of time, and it might be claimed that 2 years ago the price of butter was too high in relation to that of cars; that is, that the terms of trade were unfavourable for cars. This is not an uncommon difficulty in economic measurements, but if terms of trade tables are used with due care, they can provide some indication of relative movements in purchasing power.

A considerable amount of work on this topic was done by the Food and Agriculture Organization and published in "The State of Food and Agriculture 1956". Table 2 is from this study.

This shows that over a long period there has been a constant tendency for terms of trade to move against agriculture. Between 1913 and 1955 the only year in which terms of trade favoured agriculture was in 1950-51 owing to the boom in commodities resulting from the Korean war. Unfortunately up-to-date figures on this basis are not at present available, but the trend in commodity prices over the first 7 months of 1958 is too well known in this country to need much illustration.

Figures of the terms of trade for New Zealand exports are published in the "Abstract of Statistics". The

TABLE 3—TERMS OF TRADE* (Index numbers of Import and Export Prices and Terms of Trade, all Countries)
(Base: Calendar year 1956 = 100)

Calendar year	Import price index	Butter		Cheese		Meat		Wool		Meat, wool, and by-products		All exports	
		Export price index	Terms of trade	Export price index	Terms of trade	Export price index	Terms of trade	Export price index	Terms of trade	Export price index	Terms of trade	Export price index	Terms of trade
1948	83	91	110	61	73	58	70	55	66	63	76	68	82
1949	75	88	117	55	73	55	73	59	79	62	83	66	88
1950	82	95	116	60	73	59	72	122	149	98	120	93	113
1951	97	103	106	64	66	66	68	149	154	119	123	110	113
1952	105	110	105	70	67	77	73	84	80	83	79	88	84
1953	99	117	118	75	76	83	84	101	102	95	96	98	99
1954	98	119	121	73	74	90	92	105	107	100	102	101	103
1955	98	123	126	77	79	102	104	101	103	101	103	103	105
1956	100	100	100	100	100	100	100	100	100	100	100	100	100
1957	106	92	87	58	55	103	97	110	104	107	101	98	92
4th quarter 1956	101	89	88	91	90	95	94	106	105	100	99	97	96
1st quarter 1957	106	90	85	77	73	102	96	116	109	109	103	102	96
2nd quarter 1957	109	102	94	67	61	104	95	121	111	112	103	105	96
3rd quarter 1957	105	93	89	44	42	109	104	113	108	110	105	99	94
4th quarter 1957	100	83	83	55	55	102	102	94	94	97	97	90	90
1st quarter 1958	106	70	66	54	51	99	93	89	84	92	87	84	79

* The purchasing power (in units of imports) of 100 units of exports.

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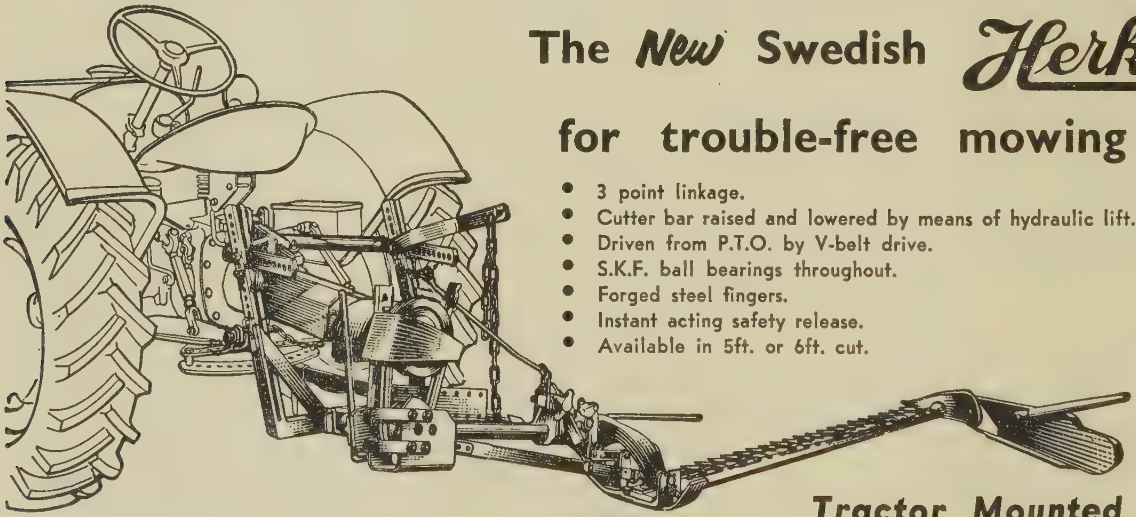

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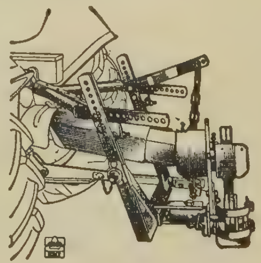
FITS DIRECT TO HYDRAULIC LIFT

The new tractor-mounted Herkules TKT mower is fitted direct to the arms of the hydraulic lift of the tractor—fits all standard tractors.



latest available (June 1958) are shown in Table 3.

There are other reasons for the failure of agricultural incomes to keep pace with those from non-agricultural sources. Some of these are the difficulty of applying mass-production techniques and labour-saving machinery to agricultural operations, at least beyond a certain point and the continuation of outmoded systems of land tenure which prevent the farmer from accumulating sufficient capital to improve his techniques and which sometimes, because of fragmentation of holdings into small strips, make it physically impossible to apply better methods of cultivation. Most of these reasons apply, however, more to what are known as under-developed countries. In the industrially developed countries systems of price support were the result of the economic depression of the 1930s and represented an attempt to get the agricultural sector of the economy back on to an even keel and, by doing this, contribute through increased farmer purchasing power to the economic rehabilitation of the industrial and servicing sectors of the community.

Development of Agricultural Protectionism

Since then the wheel has turned full cycle. The overproduction (or under-consumption) of the 1930s brought into being a system which has in its turn resulted in still more overproduction, the only difference being that the farmers responsible for the overproduction of today do not unduly suffer thereby. They are protected by the wide and strong umbrella of the paternal State; and the more powerful and more developed those states become the lower is the relative burden of carrying these support systems.

For example, in the U.S.A. realised losses under programmes primarily for the support of farm prices and incomes in the 1957 fiscal year were $3,250 million. This seems a colossal sum of money, but it was in fact only about three-quarters of 1 per cent of the gross national product of the United States for that year. In the United Kingdom the support of agriculture costs around £300 million a year, or 1.3 per cent of the gross national product, and represents about £6 per head of population.

In spite of the increase of over 60 per cent which has taken place in farm production in the United Kingdom since pre-war, Britain is, and must continue to be, a substantial importer of food; and imported food, because of its place in the cost of living, represents a major cost factor in all Britain's export industries. This is, however, cold comfort to countries such as New Zealand, where in any case low prices for our exports, caused in large measure by the expansion in United Kingdom agricultural production, have necessitated stringent import control with consequent reduction in purchases from countries such as the United Kingdom.

Despite the stepped-up production which has been achieved on her own farms Britain must continue to be a substantial importer of food.

There is, however, an important point of distinction between the effects of agricultural protectionism as it operates in the United Kingdom and as it operates in other countries. In the United Kingdom the farmer is protected by a system of production subsidies and grants to cover production costs. For example, there is a direct price subsidy on all cereals and fatstock and in addition there are grants toward the purchase of fertilisers and the cost of rearing replacement calves. An exception is milk, where because overseas competition is not possible the assistance is mainly by price regulation to ensure an adequate return to the producer. In other words, the consumer pays as a consumer and not as a taxpayer.

Thus the United Kingdom is able to open its doors to imports of farm products from virtually any part of the world. Naturally if prices fall because of increased imports, this factor is taken into account in the annual determination of farm prices negotiated between Government and industry each February. The Government is anxious that the gap between prices to the farmer in the United Kingdom and market prices should not be allowed to become too wide. This explains why the United Kingdom farmer, though not immediately affected by lower market prices, has expressed a wish to restrict imports of some types of foodstuffs.

In the U.S.A., on the other hand, the support schemes have resulted in such a huge volume of supplies that not only are imports difficult to justify, but the United States Government finds itself with embarrassingly large surpluses which present acutely difficult problems of disposal.

The Canadian Government is rapidly getting itself into a similar position, though such a comprehensive system of agricultural support there is even more difficult to justify. Proximity to the U.S.A. with its enormous surpluses completely removes any argument for self-sufficiency in food supplies on strategic grounds.

Effects on Consumption

The major food-importing countries of Western Europe, particularly Western Germany and Italy and, in some products, France, have not yet achieved complete self-sufficiency, but take steps to control imports in such a manner that their agricultural support policies are not endangered. The interests of the consumer, as such, are largely ignored. This is illustrated by comparative figures of the costs of two basic foodstuffs in which New Zealand is interested as an exporter (Table 4). The figures are in shillings and pence per pound and at the retail level as at about October 1956.

TABLE 4—COSTS OF TWO BASIC FOODSTUFFS

	Beef (sirloin)		Butter	
	s.	d.	s.	d.
United Kingdom	4	2	3	9
U.S.A.	7	1	4	4
Canada	4	8	3	5
Australia	5	1	3	10
Japan	6	0	10	8
Denmark	5	1	4	2
France	7	2	6	7
Belgium	8	7	6	7
Netherlands	N.A.		5	2
Western Germany	4	6	6	3
Sweden	7	9	4	7
Italy	6	9	7	6
New Zealand	2	8	2	0

N.A. = Not available.

It is clear that under these conditions consumption levels must be low, particularly when it is appreciated that income levels in European countries are much lower than they are in New Zealand. It is not easy to obtain satisfactory statistics of international comparisons of food consumption. The figures shown in Table 5 have been collated from available information published by the Food and Agriculture Organization and the Commonwealth Economic Committee.

There is particular difficulty with the statistics of butter and margarine consumption. Margarine is such a close substitute for butter that it is necessary to take both into account when the relative intakes of butter in the different countries are compared. At the same time it is highly likely that in countries where consumption of margarine is very high a considerable portion of this is used for cooking. In other countries the same function may be performed by other types of fat such as lard, dripping, or vegetable oils. Nevertheless even when allowance is made for this it seems clear that there is theoretically at least room for a very marked increase in consumption of livestock products.

Potentials for Increased Consumption

The extent of the potential can be gauged by a simple calculation. The total population of the six countries comprising the European Economic Community (the Common Market) is 163 million. An increase in consumption of as little as 1 lb. per head means an increase in total consumption of 73,000 tons. In the whole group of countries which would comprise the projected Free Trade area the figure would be 112,000 tons. A similar estimate for the U.S.A. and Canada gives a figure of 81,000 tons. The total of both Europe and North America gives the staggering figure of 193,000 tons, almost half the level of New Zealand's present exports of meat and more than our exports of butter.

TABLE 5—ESTIMATED CONSUMPTION OF BUTTER, MARGARINE, AND CERTAIN CLASSES OF MEAT (lb. per head 1956)

	Butter	Margarine	Butter and margarine	Beef and veal	Mutton and lamb	Pig meat	Poultry
United Kingdom	15.6	16.9	32.5	53	23	42	6.8
Canada	20.8	7.7	28.5	83	3	58	31.6
U.S.A.	8.7	8.2	16.9	95	4	68	29.4
Australia	27.5	8.3	35.8	127	72	18	9.7
Netherlands	6.4	43.9	50.3	39	0.2†	45	1.3†
West Germany	15.2	27.8	43.0	38	0.7†	58	3.7
Denmark	19.6	43.9	63.5	45	0.4†	80	5.3
France	12.6	N.A.	N.A.	54*	6*	46*	6.4*
Italy	3.1	N.A.	N.A.	22†	2†	7†	4.0
Sweden	19.2	33.1	52.3	42†	0.7†	55	4.0
Belgium	23.7	22.2	45.9	45	0.9†	47	4.2†
New Zealand	44.5	—	44.5	111	80	33	4.4

N.A. = Not available. * 1952-53. † 1954-55.

The practical realisation of this potential presents, of course, many difficulties. The all-important question, however, is the extent to which these countries can and will meet their needs from their own production. Livestock farming in most European countries could be developed very considerably; the example of Denmark shows just how great the potential is. There is no doubt that under the stimulus of the various agricultural support measures operating in Europe farm production is increasing. It also seems highly likely that the agricultural provisions of the Common Market Treaty will accelerate this development. It is not yet known what form the measures for handling agricultural products will take. This was the subject of a special conference of the six participating countries in July of this year; but it seems certain from the deliberately vague provisions of the Treaty that there is every intention of retaining and expanding the agricultural protection at present existing.

This reinforces the necessity of making direct approaches to these or other countries, requesting that they modify their policies of agricultural support. These policies are now very firmly rooted, however, and while some countries are endeavouring to modify them for domestic reasons, there are limits to what they can do. Some are in the unfortunate position of the sorcerer's apprentice who succeeded in ordering the broom to carry water, but could not find the magic formula to stop it when the room was flooded.

Dangers to New Zealand

The dangers to New Zealand are very real. Over the years we have built up a very specialised agriculture catering for overseas demand for a limited range of livestock products. The possibilities for diversifying this agriculture are fairly limited; and indeed beyond giving more emphasis to beef and veal production at the expense of dairying it is doubtful whether attempts at diversification are wise. New Zealand's strong point is her low production costs; low, that is, in real terms of physical input. We can supply increasing quantities of high-quality foodstuffs of a type of which the world's increasing population needs much more than is available today.

To dispose of the increasing quantities that will become available we must gain entry to new markets. This seems to demand an approach to individual countries, particularly those which would be likely to offer some possibilities for long-term trade expansion such as the major European countries and Japan, with a view to obtaining reasonable quotas for meat and dairy produce. There would undoubtedly be serious difficulties in implementing such a proposal, but it probably does offer the one real hope of achieving that market expansion essential to our future development.

Trade, however, is essentially a two-way affair, and these industrial countries are seeking outlets for their manufactured goods. It will be necessary for us to ensure that countries which buy from us have reasonable opportunities of competing on reasonably favourable terms in the New Zealand market. At the same time we must not lose sight of the fact that the United Kingdom must continue to be our main market for meat and dairy produce for a long time to come and that the potential for increased consumption of these products in the United Kingdom is not inconsiderable. There are many reasons why New Zealand is entitled to a substantial share of any expansion in the United Kingdom market, and machinery exists in terms of articles 1 and 2 of the 1957 supplement to the Ottawa Agreement for New Zealand to approach the United Kingdom each November for discussions on policies for agricultural production and trade in agricultural products, and for sympathetic consideration of problems of meat marketing if we feel that our trade is seriously threatened.

It is important above all things to avoid being stampeded into what may be termed panic measures in the face of what may prove to be temporary difficulties or difficulties which are not as great as they seemed at first sight. New Zealand's efficiency as an agricultural producer has been achieved by specialisation on a limited range of livestock products which certain natural advantages plus a high degree of farming skill enable us to produce at low real costs. Any radical departure from this traditional policy could be dangerous unless we are absolutely certain that no possible alternative exists.

Weed Control in New Pastures

By D. M. E. MERRY,
Instructor in Agriculture,
Department of Agriculture,
Pukekohe

HORMONE weedkillers of standard type 2,4-D, 2,4,5-T, and MCP have been widely used by many farmers in the past few years. About a year ago two new materials were introduced and though sold under specific trade names, are technically known as 2,4-DB and MCPB to distinguish them from their forerunners.

THESE two new materials have proved very useful for controlling weeds in such crops as lucerne and peas, and particularly new pasture where standard hormones are extremely damaging to clovers. Before the new materials were marketed numerous field trials were put down by instructors and others. It was found that excellent control of such weeds as seedling docks, buttercup, and Californian thistle could be obtained in newly sown pastures, provided spraying was done after seedling clover had developed its first fully trifoliate leaves.

Part of the trial area, showing a dense growth of docks on the right.

← The excellent control of docks obtained with 2,4-DB on the area in the foreground is well shown by comparison with the area in the background.

Excellent Dock Control

The illustrations show a trial in the Drury area near Auckland on a pasture sown in the autumn of 1957. There are six plots in all. The treatments were MPCB at 1 lb., 2 lb., and 3 lb. acid equivalent per acre and 2,4-DB at the same rates. The latter three plots are alongside untreated pasture in which there is a dense establishment of seedling docks. On all six plots there was excellent dock control, just as in an earlier trial results had been excellent with both young buttercup and dock.

The illustration at left is of the area treated with between 1 lb. and 2 lb. acid equivalent of 2,4-DB per acre, and the contrast with untreated farm pasture in the background shows the excellent dock control obtained. Soon after the trial results began to show up the farmer sprayed the whole paddock with 2,4-DB at 1½ lb. acid equivalent per acre and got the same excellent result as had been obtained on the experimental plots.

On newly sown pastures these new products have shown themselves exceptionally good for controlling some weeds which are very difficult to eradicate from older paddocks. Their wider use can be commended to farmers for such special purposes.

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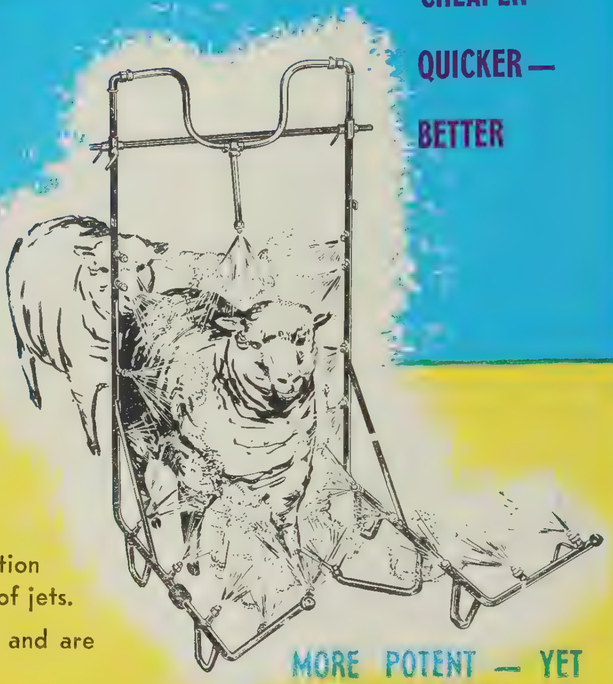

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Sheep may be dipped straight 'off-shears'. No recirculation of wash—no risk of infection—no stripping—no clogging of jets.

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And—the cost of dipping per sheep is substantially lower than other methods.

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One gall. makes dipping fluid for approximately 2,560 sheep. LESS THAN ½d. PER SHEEP.

Extended Blowfly Control. One gall. sufficient for approx. 1,600 sheep. Costs just over ¾d. per sheep.

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CENTURY HOLTON SHEEP SPRAYER

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Production and Management Benefits from Mole Drainage

In November 1952 about half of this 4-acre paddock at Murchison was mole drained by a system of minor moles pulled at 16 in. depth. Spear junctions to major moles were made at 20 in. depth. Since then the farmer has continued to manage the paddock as one block. In one season it was shut for hay and the drained area yielded 11 bales, whereas an equivalent area on the undrained block gave only 2 bales.

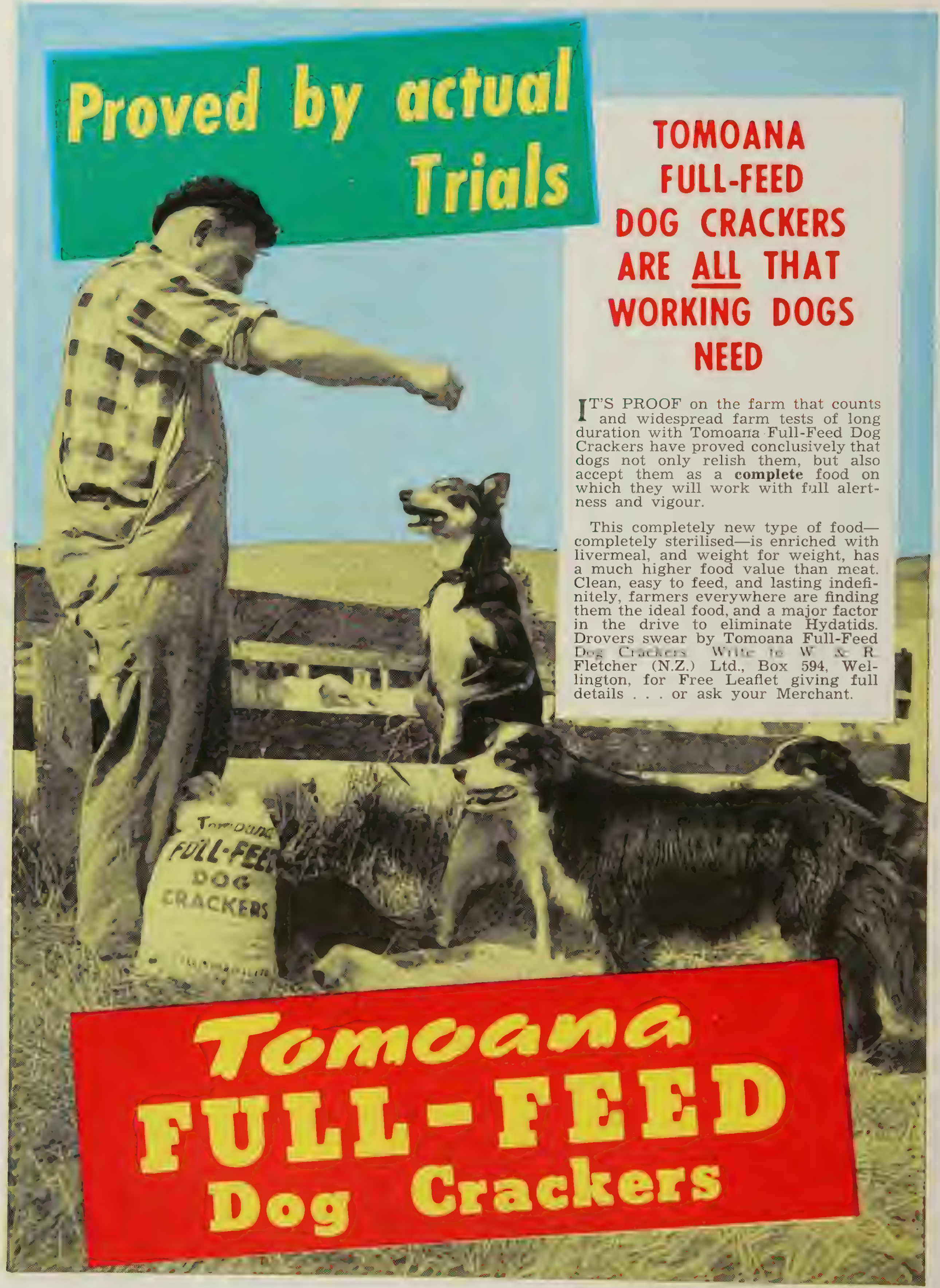
By J. F. SCOTT,
Drainage Instructor,
Department of Agriculture,
Christchurch

THE intelligent use of the mole plough can achieve outstanding results on wet land suited to this type of drainage. The minimum requirements are a plastic clay subsoil free from subsurface obstructions and a general surface fall toward the outlet.

EFFICIENT drainage results not only in higher production, but also has widespread effects on the general farm management. After drainage a reduction in production costs and added convenience are two results which make for better and easier farming. Drained soils can be cultivated earlier in the season and generally require less working than soils which have lain sodden through winter. This should allow for better seedbed preparation and consequently better crops and pastures.

One of the most striking effects of drainage is the improved surface conditions during and immediately after wet weather. Pugging should not occur with normal stock concentrations and it should be possible to drive farm vehicles over the flatter grades without risk of bogging or cutting up the pasture. The avoidance of mechanical damage of this nature should be an important factor in extending the life of pastures on wet land.

▼ An area typical of many thousands of acres of improved Canterbury foothill country. Though problems facing farmers in this area have been made more difficult by the impervious subsoil, to a great extent drainage as a step in development has been overlooked.



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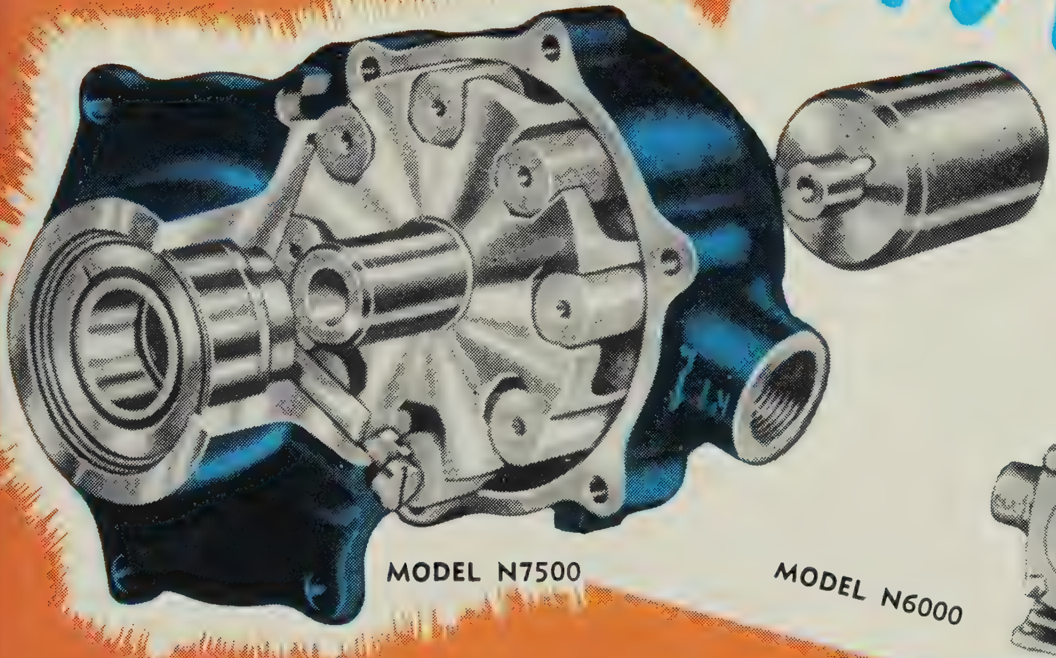
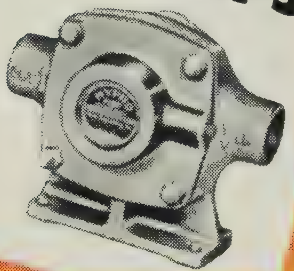


MODEL N7500



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HYPRO pumps are most suitable and economical for the new sheep sprayers. They provide ample pressure and volume for either tractor or independent engine drive. For livestock spraying they have the pressure to drive the spray material through the hair or wool and thoroughly cover the hide.

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Both pumps have ample volume and pressure for insect spraying through either the boom type sprayer, or cluster jet equipment. Use it to spray weeds in postures and to control insect pests on crops.

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Spray barns for fly control, flush out pig pens, poultry houses, clean cattle trucks and other farm machinery. HYPRO pumps do all these jobs and hundreds more with volume and pressure to spare.

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N7500 giving pressures up to a maximum of 350 lbs. per sq inch

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These 3 models are equipped with the famous exclusive

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Also available, pressure control units, booms, guns, hose and all auxiliary equipment.

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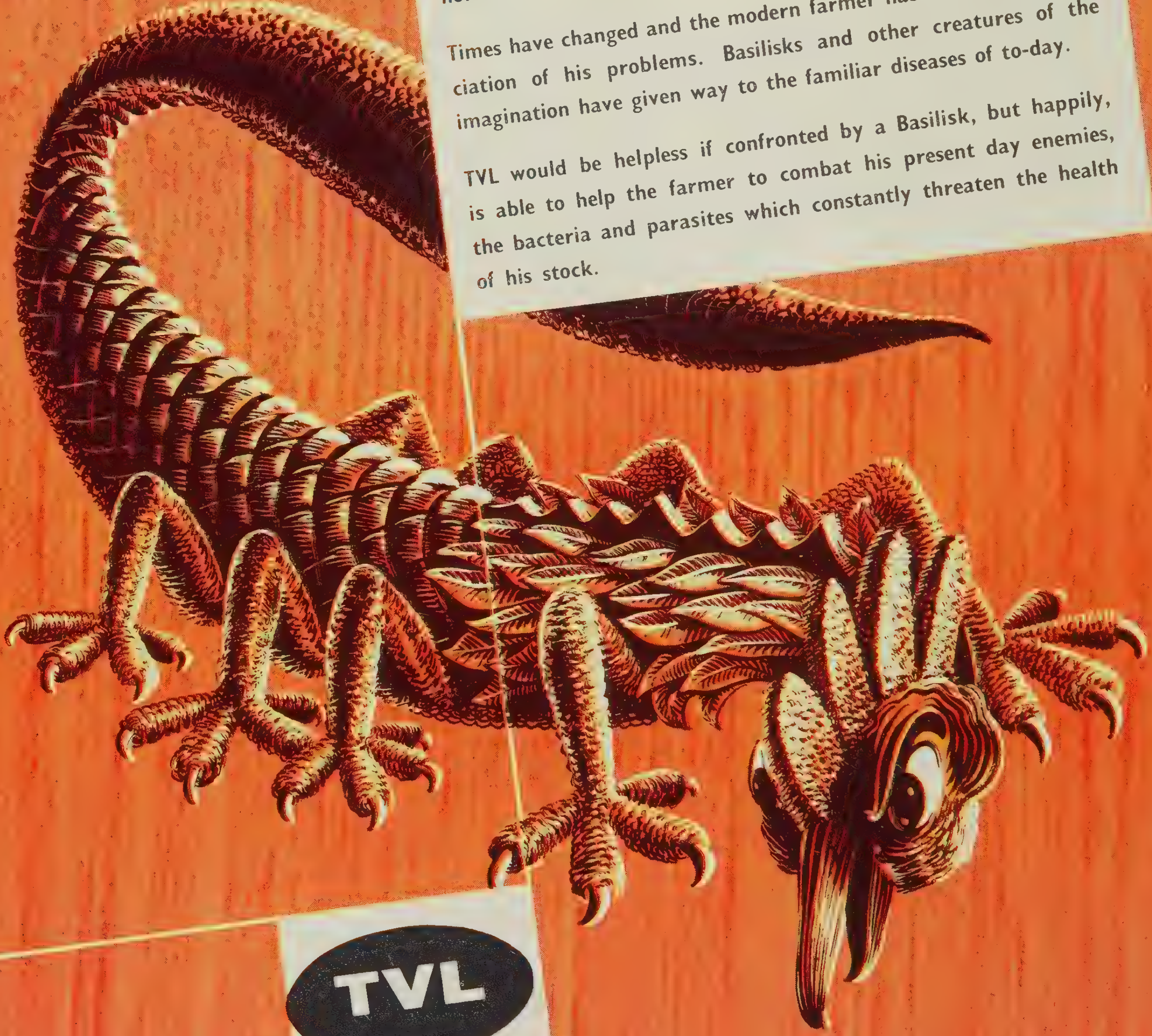
Aristotle maintained that the only known way of disposing of a Basilisk was to induce it to look in a mirror, whereupon its own horrible reflection was enough to kill the creature immediately.

Times have changed and the modern farmer has a sounder appreciation of his problems. Basilisks and other creatures of the imagination have given way to the familiar diseases of to-day.

TVL would be helpless if confronted by a Basilisk, but happily, is able to help the farmer to combat his present day enemies, the bacteria and parasites which constantly threaten the health of his stock.



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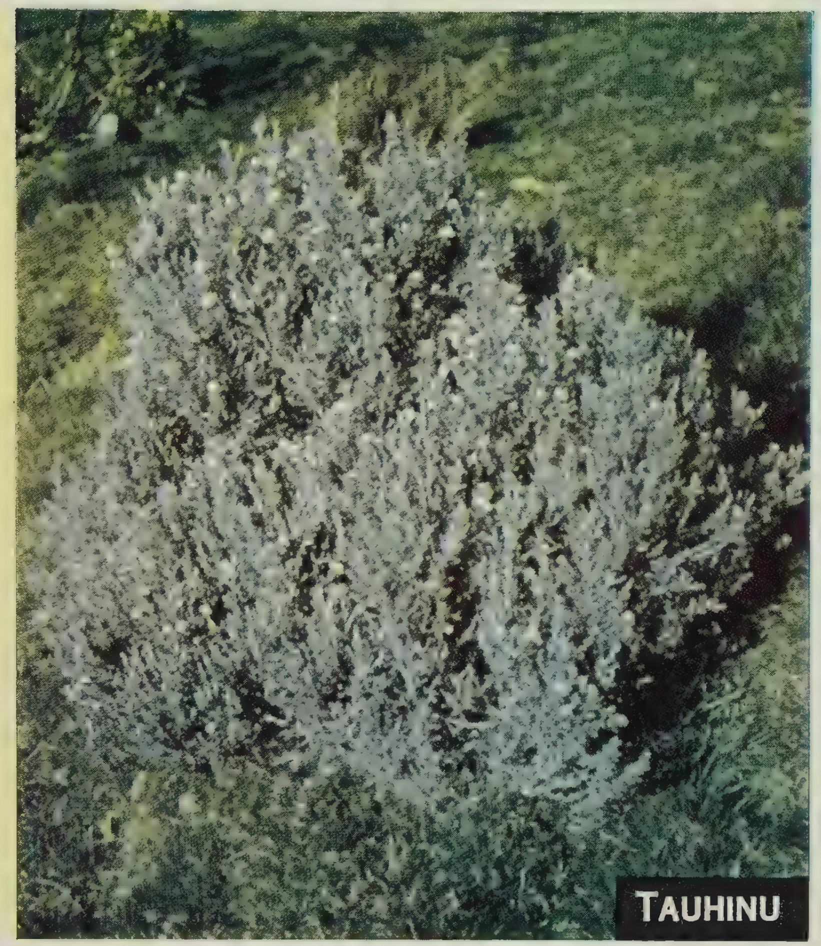
WEED IDENTIFICATION AND CONTROL

By D. I. GLUE, Instructor in Agriculture, and L. J. MATTHEWS, Weeds Research Officer, both of the Department of Agriculture, Wellington

This is one of a series of articles illustrated in colour to appear in the "Journal" from time to time in which identification and control of various weeds will be discussed.



TAUHINU (*Cassinia leptophylla*) is a native shrub which has become a very common weed of poor, open pastures, particularly in coastal areas. The leaves, which are about 1/10 in. long, with straight sides and rounded tips, are green on top and covered with a white or yellowish down on the under surface. This down also covers the twigs and younger branches. The small white flowers are grouped in tight clusters, and the whole plant has a curiously sweet smell.

TAUHINU is a prolific seeder, and the seed, which is equipped with a hair "parachute" (pappus), is carried long distances by the wind.

There are two main stages in the control of tauhinu: First is the destruction of the plants; next the improvement of the sward to prevent reinvasion of the area by seedling tauhinu.

Killing Plants

Several methods can be employed to kill plants. As tauhinu has a weak and shallow root system, young plants can be pulled out by hand. Larger plants should be grubbed or cut. If the stem is cut below, at, or slightly above ground level, no regrowth occurs.

Areas of dense tauhinu are sometimes burnt standing. Even if the fire does not completely destroy the plants, they do not recover from a severe scorching. On country where a crawler tractor can operate the cheapest and quickest way to clear tauhinu is to crush it with a weighty frame, usually constructed of railway irons welded together.

The rectangular or triangular frame is dragged behind the tractor on a wire hawser. Strong hooks, cut out of thick steel plate and welded on to the sides of the frame, increase its efficiency in clearing the scrub. A well constructed frame uproots or smashes the tauhinu very drastically, and even plants which do not appear to be badly damaged receive such a severe wrenching and lose so much bark that they usually die. A skilled operator can control the frame on the end of its hawser so that it crushes tauhinu in places too steep for the tractor to go.

Once tauhinu has been killed, the leaves and small branches soon fall off and rot, and even the main stems disintegrate so quickly that it is not necessary to collect and burn them.

Chemical Treatment

To date no chemical control appears satisfactory. Young plants are killed by high rates of 2,4,5-T applied as a spot application, but hand pulling, cutting, or grubbing is just as efficient. The application of 2,4,5-T oil concentrate in diesel fuel oil up to a month before burning does improve the chances of a clean burn of standing tauhinu. This application may be made aerially.

Pasture Improvement

Clearing the tauhinu must be complemented by the other important aspect of control, improving the pasture. The conditions which favour the regeneration of tauhinu are open spaces in a poor, low-fertility sward, and its need for these conditions is so specific that it is one of the easiest plants to control by sward improvement.

The main weapons in the control of tauhinu have been topdressing and oversowing, followed by intensive on-and-off grazing with sheep and cattle. Grazing management is important, as any seedlings which manage to strike are readily nipped out or trampled out when the sward is grazed by large numbers of stock.

the CENTURY Holton Sheep Sprayer

A NEW SPRAY METHOD DESIGNED TO PREVENT FLY STRIKE — CONTROL KEDS & LICE

The Century Holton Sheep Sprayer complies with the requirements of the Stock Act, 1908 (amended 1947) and when used with the correct chemicals (Dieldrin or Aldrin) and in the correct manner, is recognised as a legal method of "Dipping" by the New Zealand Department of Agriculture.

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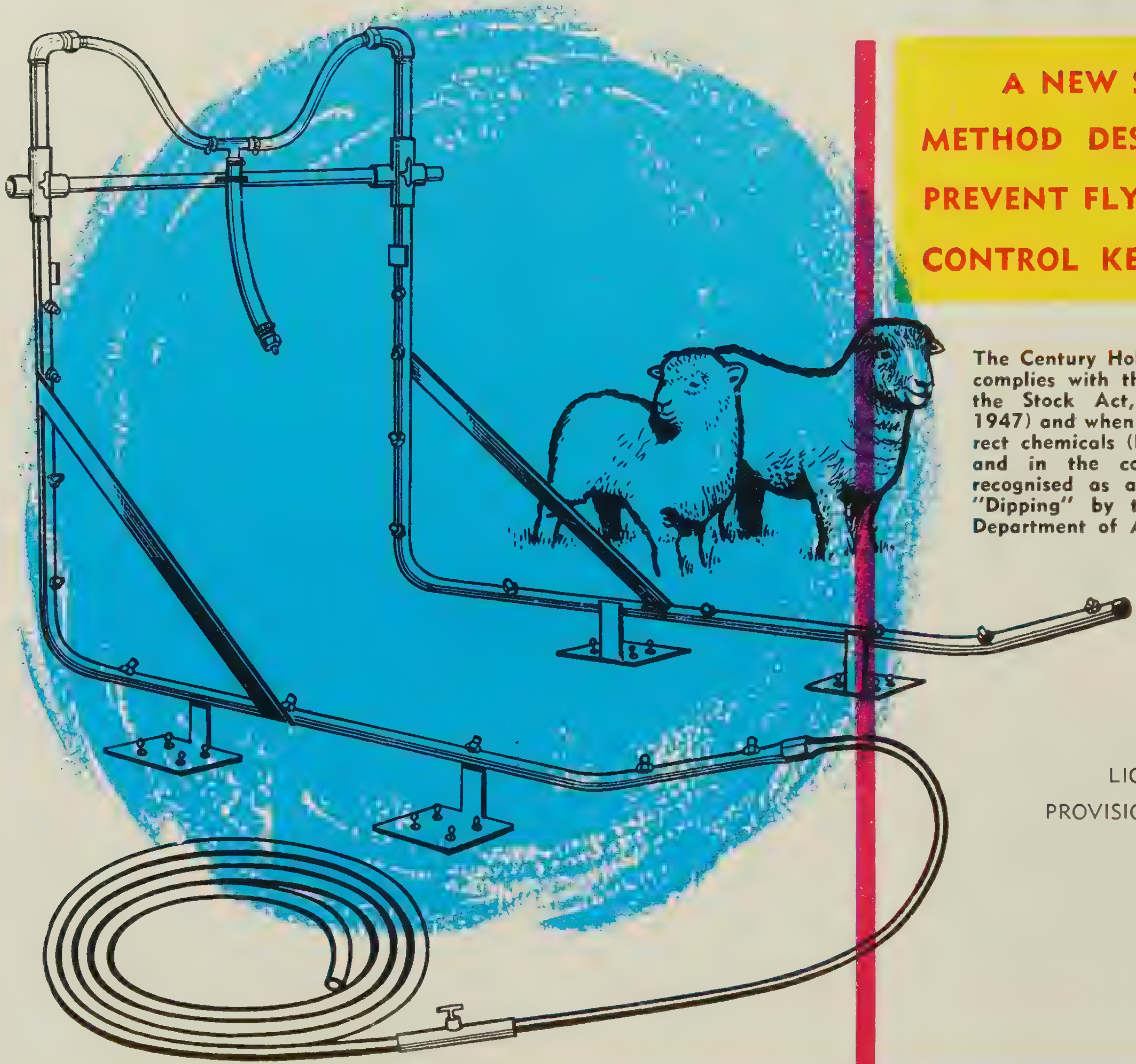
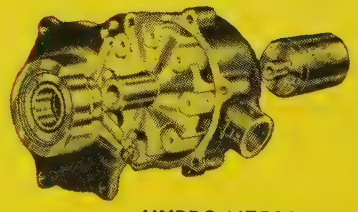


The pumping unit

The machine operates with a high pressure Hypro N7500 Nylon roller pump used at a pressure of 150 lb. per square inch. The pump unit may be coupled direct to a tractor power take off, or driven by an independent engine.
It is easy to operate without risk of injury or upset to the sheep, and, with very much reduced costs.



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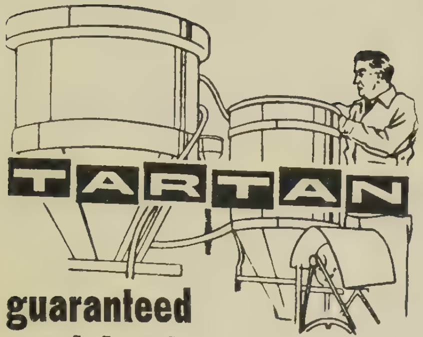

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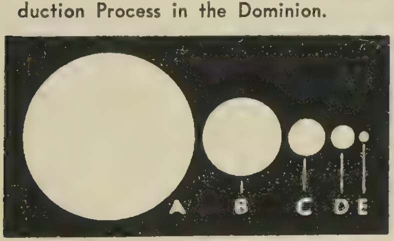

The diagram above shows sizes of common materials compared with Tartan Fenodren.

A: Particle of typical flour. *B:* Particle of face powder. *C, D & E:* Typical size range of Tartan Fenodren particles.

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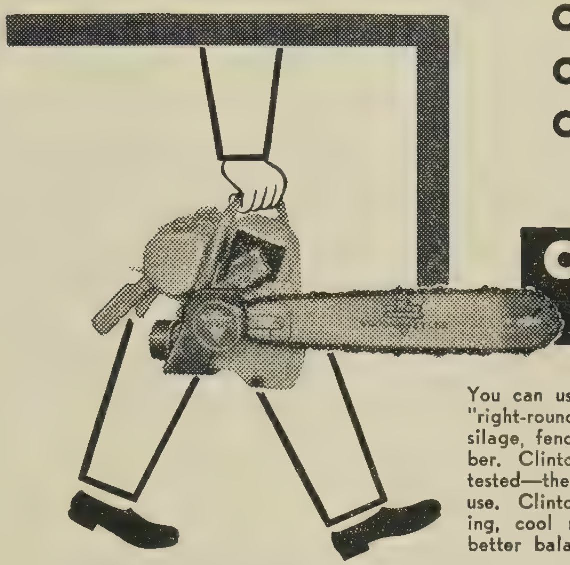

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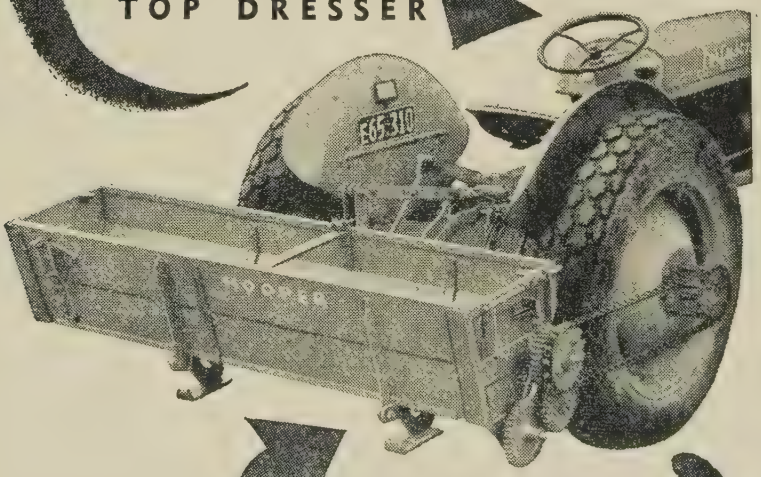

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Use of Cobalt Bullets: Some Questions and Answers

SO far as is known at present manufacturing details of size, shape, density, and amount of cobalt will remain standardised for some time in the commercial 90 per cent cobalt bullet. Consequently this product is under investigation in current trials and will probably be used in others planned for the future. More knowledge is needed before the ultimate place of the bullet in preventing cobalt deficiency under New Zealand conditions is determined. Meanwhile a number of questions suggest themselves and to some of these tentative answers can be given on the basis of existing information. Here are some of the more important:

Are Sheep Bullets Effective in Cattle?

From advice received from the Nicholas Research Institute in Victoria, Australia, it appears that sheep bullets are not satisfactorily retained by cattle. A large bullet which might be suitable has been developed in Australia, but at present is available only for experimental purposes.

What Proportion of Sheep Fail to Retain the Bullets?

New Zealand experiments do not yet provide sufficient information on this point. Australian work suggests that about 5 per cent of treated sheep may shed their bullets soon after dosing. It is recommended by the manufacturers that these sheep, presumably detected by their failure to thrive, should be re-treated.

How Long Do Retained Bullets Last?

In theory, single cobalt bullets could provide sufficient cobalt to last breeding ewes and rams a lifetime. In practice, however, the effective life of the bullets is not yet known. On the basis of work in Australia the manufacturers tentatively suggest that they should last a year, but could perhaps last longer. On the other hand a coating of calcium phosphate might, at least in some animals, eventually seal off the surface of the bullet and in these individuals its effective life may be measured only in weeks or months.

Unweaned lambs require special mention. On less severely affected land unthriftiness is not usually serious in lambs before weaning time, but could be a problem under conditions of more severe deficiency when it can be expected that ewes will also show the disease. Damage to the throats may occur if bullets are given to lambs before they are about 2 months old. Furthermore, the danger of bullets becoming coated fairly quickly is probably greater in unweaned lambs than in older sheep.

Until more information is available the administration of bullets to unweaned lambs cannot be regarded as a satisfactory routine measure. Because cobalt topdressing will protect cattle, mature sheep, and lambs of all ages there is, at present, no good reason why cobalt bullets should replace cobalt topdressing on severely deficient areas such as the pumice lands of the North Island. Otherwise, weaned lambs or mature sheep treated with bullets should be watched for possible failures, and in general the bullets should not, in the meantime, be relied on to last for more than a year.

How Does the Cost of the Bullet Method Compare with that of Existing Methods?

This will of course depend partly on unresolved questions of retention rate, the effects of coating, and other factors affecting the length of time bullets remain effective. But if we neglect failures and accept the present assumption that bullets should be given once each year, the relative costs of bullet treatment, cobalt topdressing, and cobaltised licks can be considered in terms of the kind of farming involved.

Exclusive of labour charges entailed in their administration cobalt bullets cost 1s. each. Cobaltised superphosphate costs about 3s. more per acre than ordinary superphosphate in the North Island and about 2s. 6d. more in the South Island. Hence, if carrying capacities are on an average more than about 3 sheep per acre, cobalt topdressing is cheaper. In particular fat lamb production is in general associated with high carrying capacities. Consequently on fat lamb farms cobalt bullets will not usually be as economical as cobalt topdressing as a routine method of prevention, but could be useful as an emergency measure pending the application of cobalt to the land. Where carrying capacities are less than 3 sheep per acre cobalt bullets may be cheaper than cobalt topdressing.

The cost of providing cobaltised licks varies greatly, but is probably not less than 2s. per sheep per year. Some animals do not take sufficient lick and therefore lose the benefit of the cobalt. Thus, provided always that the number of bullets which fail are not too many and that it is practicable to detect and re-treat the sheep concerned, cobalt bullets should be preferable to cobaltised licks on extensively grazed hill country or where only a part of the farm is topdressed each year.

Will Cobalt Bullets Assist in the Diagnosis of Cobalt Deficiency?

Yes: as mentioned previously the only sure method of diagnosis is by carrying out a trial on the farm. Hitherto such trials have entailed yarding and administration of cobalt doses at weekly intervals. The use of cobalt bullets will avoid this. Two similar groups each containing 20 or more animals should be selected for trial. One group should be given cobalt bullets and the other group left untreated. Thereafter, the thrift of the bulleted group is compared with that of the untreated group for a period of from 1 month to 3 months.

Preferably sheep in both groups should be weighed at least twice: at the beginning of the trial and at the end. An easy method of weighing lambs is for the operator to stand supporting the lamb on bathroom scales. The difference between the recorded weight and the weight of the operator gives the weight of the lamb. With 20 or more lambs in each group a difference in average weight gain of more than 5 lb. in favour of the bulleted group will usually be indicative of cobalt deficiency.

Finally it must be stressed that where unthriftiness in stock is due to causes other than cobalt deficiency no benefit can follow from the use of cobalt given as a bullet or in any other form.

But if cobalt deficiency is suspected, its presence or absence can be confirmed easily with the use of only a set of scales and a few shillings' worth of cobalt bullets.

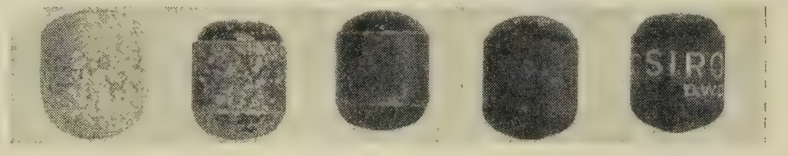
COBALT BULLETS

By E. D. ANDREWS,
Principal Scientific Officer,
Department of Agriculture Animal
Research Station, Wallaceville

EARLY this year a new way of treating cobalt deficiency disease in sheep by giving cobalt bullets became available to New Zealand farmers. In this article the cobalt bullet is discussed and an interim assessment made of its possible uses in New Zealand farming.

▲ Cobalt bullets compared in size with a half-penny.

▼ The four bullets on the left were recovered from weaned lambs and show varying degrees of encrustation. On the right is an unused bullet.



MOST farmers now know that cobalt deficiency (bush sickness) is caused by a low cobalt content of pasture. Micro-organisms in the paunches of cattle and sheep convert the cobalt from feed into a substance called vitamin B_{12}. This vitamin is essential for the maintenance of health and production in farm stock. So if cobalt intake is low, vitamin B_{12} is reduced and the animal becomes unthrifty and may die. Lambs are more sensitive than mature sheep to cobalt deficiency; sheep are more susceptible than cattle; and calves 6 to 18 months old are more susceptible than adult cattle.

For many years Wallaceville workers have analysed livers for cobalt content to assist in diagnosing the disease on the farm. More recently they have found that examination of livers for vitamin B_{12} provides a better test of the presence or absence of cobalt deficiency. However, it is unlikely that laboratory tests alone will ever give an infallible means of diagnosis. On the other hand a virtually certain diagnosis can be made on the farm by comparing the thrift of a group of sheep given cobalt with that of a similar untreated group. This method is discussed in more detail later in this article.

Cobalt is used in Australia to prevent phalaris staggers, a disease of cattle and sheep caused by consumption of the pasture plant *Phalaris tuberosa*. Only negligible amounts of *Phalaris tuberosa* are, however, grown in New Zealand and the disease is relatively unimportant in this country.

In Australia the prevention of cobalt deficiency has in practice proved difficult. Cobalt topdressing is considered uneconomic on the extensively grazed holdings sometimes associated with cobalt deficiency in that country. Furthermore, the nature of the soil is often such that cobalt applied to the land is not readily taken up by fodder plants. For these reasons greater reliance has hitherto been placed on cobaltised licks and drenches.

In New Zealand the situation is different. Cobalt drenches have been useful for detecting cobalt deficiency in animals on the farm, but because of the inconvenience and labour involved, they are little used as a routine method of prevention. Cobaltised licks have been used on extensively grazed hill country or where only a part of the farm is topdressed each year. Otherwise topdressing pastures annually with cobalt sulphate, usually as cobaltised superphosphate, has proved cheap and effective. Against this background the cobalt bullet must be considered.

Some 3 years ago the attention of scientific workers in the Commonwealth Scientific and Industrial Research Organisation (C.S.I.R.O.) at Adelaide, South Australia, was drawn to the fact that heavy foreign bodies tend to remain permanently in the forestomachs of cattle and sheep. This suggested the possibility of a heavy cobalt pellet designed to release slowly and continuously the very small but necessary amounts of cobalt required by sheep.

After preliminary experiments with various cobalt compounds a hard, dense pellet (bullet) was developed which consisted of 75 per cent of cobaltic oxide and 25 per cent of china clay moulded by compression into a small cylinder with domed ends and baked at a high temperature (1,000 degrees C.).

Field trials showed that this type of bullet would prevent phalaris staggers and cobalt deficiency disease in sheep. Later the proportion of cobalt oxide was increased to 90 per cent, which resulted in a heavier and more dense bullet. An ideal bullet is still being sought by the Australian workers. Meanwhile C.S.I.R.O. tentatively recommends the employment of the 90 per cent bullet, a product which has been developed commercially and is now available in New Zealand.

Early in 1957 C.S.I.R.O. made available to the New Zealand Department of Agriculture a supply of 75 per cent bullets, the 90 per cent product not having been developed at that time. Except where otherwise indicated these bullets were used in the experiments described below.

New Zealand Experiments

Trials with Weaned Lambs

Between 27 January and 5 April 1957 a trial was carried out by the Animal Research and Animal Industry Divisions on a cobalt-deficient area at the Winton Experimental Farm, Southland. The lambs were weighed and divided as evenly as possible on a weight basis into 3 groups. One group was given no treatment and was a control. A second group received weekly doses of cobalt, and lambs in the third group were each given a cobalt bullet. All lambs were weighed weekly. After the last weighing the

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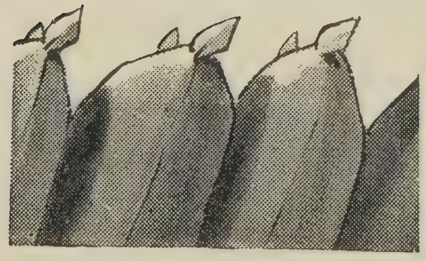

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lambs were killed at the Makarewa freezing works, and a search was made for the bullets in the gut contents of those lambs which had received them. Livers were taken from the 3 groups for cobalt and vitamin B_{12} estimations.

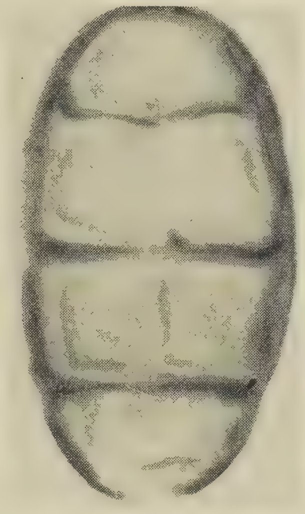
Weight responses of the cobalt-dosed and cobalt-bulleted groups over the 14 weeks are compared in Table 1.

Analyses of the livers showed that, as expected, cobalt and vitamin B_{12} contents for the untreated group were very low, but corresponding figures for cobalt-dosed and cobalt-bulleted groups were normal. These results supplement those given in Table 1 which show that cobalt bullets were as effective as cobalt dosing in controlling cobalt deficiency.

Of the 12 bullets given only 10 were found in the forestomachs. It is not known definitely whether two were lost after slaughter at the works or some time before this. However, the two lambs concerned made good weight gains and the cobalt and vitamin B_{12} in their livers were normal.

After the recovered bullets were cleaned some showed a whitish unsoluble deposit of calcium phosphate. One bullet was completely encrusted. Though it seemed likely that a deposit of this kind would ultimately seal off the cobalt in the bullet from the paunch contents, in this particular experiment the cobalt and vitamin B_{12} in the liver of the lamb concerned were normal and the animal grew satisfactorily.

SPORIDESMIUM BAKERI



alias

Stemphylium botryosum

THE fungus reported in our October issue as having been incriminated by facial eczema research workers as producing the toxin causing facial eczema was tentatively identified as *Stemphylium botryosum*. The Commonwealth Mycological Institute, Kew, has now advised Dr R. H. Thornton, Soil Bureau, Department of Scientific and Industrial Research, that the fungus has been positively identified as *Sporidesmium bakeri*.

Between 20 March and 26 May 1958 G. F. Sommerville of the Feilding and Districts Veterinary Club carried out an experiment on a farm near Apiti. He used 3 groups each containing 25 hoggets. One group acted as a control, a second group received copper, while lambs in the third group were each given a 90 per cent cobalt bullet. At the end of the trial he found that the average weight gain made by the copper group was not significantly better than that made by the control group. There was, however, a highly significant response to cobalt bullets, the average gain in favour of the bulleted group as compared to the control group being 12½ lb. A similar result with cobalt bullets in South Canterbury is described by M. C. Armstrong in the September 1958 issue of "The New Zealand Journal of Agriculture".

Overall, the above experiments show that at least over a period of 2 to 3 months weaned lambs on cobalt-deficient land will respond to cobalt bullets.

Trial with Unweaned Lambs

On 16 October 1957 a mob of twin lambs which, with their mothers, had been on marginally cobalt-deficient land at Wallaceville from birth were transferred to the Department's farm at Kaitoke. Part of the farm consists of a soil type (Kopua silt loam) provisionally classified as marginally cobalt deficient, but the particular paddock on which the experimental animals were placed had in the previous season produced marked cobalt deficiency in weaned lambs.

Experimental lambs were weighed and divided into a control (untreated) group, a group to be given weekly doses of cobalt, and a third group in which each lamb received a cobalt bullet. Ages of lambs given cobalt bullets ranged from 6 to 9 weeks. The control group contained 18 lambs and the other two groups each contained 12 lambs. All lambs were weighed weekly and were weaned on 17 December.

Control lambs started to die in November 1957 and by 11 February 1958 there were no survivors. Cobalt and vitamin B_{12} contents of livers were very low, confirming that deaths had been caused by cobalt deficiency. There were no deaths in the cobalt-dosed group. In the cobalt-bullet group one lamb died in December from some cause other than cobalt deficiency. After continuing losses in weight from December one other lamb in the bullet group died in February 1958. Its bullet was recovered from the paunch and found to be encrusted with calcium phosphate. Since the liver was very low in vitamin B_{12}, it appeared that death had been caused by cobalt deficiency. On 25 March the Kaitoke farm was topdressed with cobaltised fertiliser. Though it was not the intention to spread cobalt on the experimental paddock, subsequent evidence showed that some cobalt had drifted on to the area. Consequently the trial had to be ended from this date.

Results of the trial are shown in Table 2.

Table 2 shows that in the first 3 months of the trial the bulleted lambs

TABLE 1—WEIGHT RESPONSES OF THE COBALT-DOSED AND COBALT-BULLETED GROUPS

Group	No. of lambs	Deaths	Average weight gains	Average carcass weights
			lb.	lb.
Untreated	22	7	—7	24
Cobalt-dosed	12	Nil	+23	38
Cobalt-bulleted	12	Nil	+24	38

TABLE 2—AVERAGE GAINS (LB.) FOR SURVIVING LAMBS IN EACH GROUP FROM 16/10/57

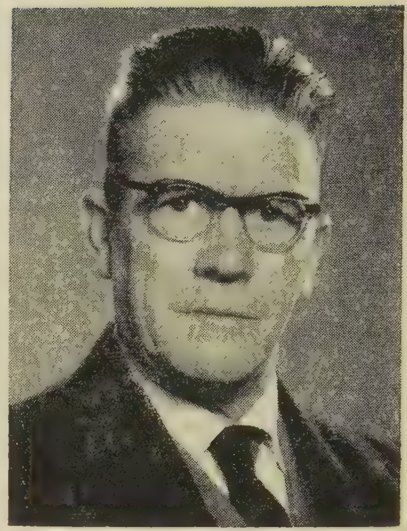
Group	No. of lambs	Deaths	Weighing dates				
			1957		1958		
			19/11	17/12	22/1	11/2	25/3
Untreated . .	18	18	2	0	—5	—13	All dead
Cobalt-dosed . .	12	Nil	19	23	28	31	31
Cobalt-bulleted . .	12	2*	11	16	24	30	32

* One from unknown cause, one from cobalt deficiency

(Continued at foot of page 430)

Dr I. J. Cunningham Appointed Assistant Director-General

DR I. J. CUNNINGHAM, Superintendent of Wallaceville Animal Research Station, of the Department of Agriculture, since 1945, has been appointed Assistant Director-General of Agriculture. He succeeds Mr P. W. Smallfield, who became Director-General on the retirement of Mr R. B. Tennent at the end of August.



Dr Cunningham.

BORN at Mangatainoka in 1905, Dr Cunningham received his early education at Pahiatua District High School and Dannevirke High School. In 1923 he joined the Public Trust Office, but a year later was transferred at his own request to the Chemical Laboratory of the Department of Agriculture. He studied at Victoria University College, being awarded the senior scholarship in chemistry when graduating B.Sc. and graduating M.Sc. with first-class honours in chemistry.

In 1929 under an arrangement between Great Britain and New Zealand for an exchange of research workers he went to the Rowett Research Institute, Aberdeen, where he specialised in work on nutrition. During this time he completed his Ph.D. degree with a thesis on the role of copper in nutrition.

Returning to New Zealand in 1931, Dr Cunningham took up work at Wallaceville as Research Officer in Animal Nutrition. In 1936 he was awarded a veterinary science bursary and in 1938 graduated B.V.Sc. at Sydney University with first-class honours and university medal. On returning to New Zealand he was appointed Chief Biochemist at Wallaceville. He succeeded Dr C. S. M. Hopkirk as Superintendent at Wallaceville in 1945 when Dr Hopkirk left New Zealand to take up an UNRRA appointment.

Dr Cunningham is probably best known to farmers for his work on copper deficiency in sheep and cattle, and adoption of his recommendations for topdressing with copperised superphosphate or injection of copper cerates has improved health and production of stock over thousands of acres. In recognition of his outstanding work in this field he was invited in 1950 by the McCollum Pratt Institute of Johns Hopkins University, Baltimore, to address a special conference on micro nutrients.

In 1946 Dr Cunningham was a New Zealand delegate at the conference in Adelaide of the Australian and New Zealand Association for the Advancement of Science. He visited research stations in the U.S.A., Canada, the United Kingdom, and Australia in 1949.

The esteem in which Dr Cunningham is held by his scientific colleagues has been expressed by his election to the presidency of the New Zealand Veterinary Association and the New Zealand Society of Animal Production.

Cobalt Bullets

(Continued from page 429)

on an average gained rather less weight than the cobalt-dosed lambs. The reason for this is not known and is only partly attributable to the poor performance of the bulleted lamb which ultimately died from cobalt deficiency. It is, however, clear that in February and March 1958 the average weight gains of surviving bulleted lambs were virtually the same as those of the cobalt-dosed lambs.

The trial shows that under some circumstances severe cobalt deficiency may appear in lambs by November on land hitherto regarded as only marginally cobalt deficient. With care bullets can be given to lambs when they are about 2 months old. Though in this experiment surviving bulleted lambs were protected from cobalt deficiency for at least 5 months, results support the possibility suggested from Australian reports that in a proportion of unweaned lambs coating of the bullets may render them ineffective within a few weeks of administration.

Trial with Ewes

The mothers of the lambs in the trial described above were weighed on 16 October 1957. A week later the 6 mothers of the 12 bulleted lambs were also given a cobalt bullet. The remaining 15 ewes were left untreated. When the lambs were weaned on 17 December the ewes were transferred to another marginally cobalt-deficient paddock at Wallaceville. On 21 January 1958 they were returned to the original cobalt-deficient paddock at Kaitoke.

Though at this time there was no evidence that the bullets first given to ewes had failed, a requirement of the experiment was that treated ewes should remain free from cobalt deficiency. As a precaution, therefore, these ewes were re-treated, this time with commercial bullets (90 per cent) which had meanwhile become available. During the trial there were 6 deaths in the untreated group. Two ewes were killed by a stray dog. Low vitamin B_{12} contents of livers from the remaining 4 confirmed that they died from cobalt deficiency.

Average weight changes of untreated and bulleted ewes are compared in Table 3.

The two bullet treatments given for the purposes of this trial would not normally be applicable in farming practice. Results do, however, show that cobalt deficiency may occur in ewes on soils hitherto regarded as only marginally cobalt deficient and that under the circumstances of the trial cobalt bullets were effective in preventing the disease.

TABLE 3—AVERAGE WEIGHT CHANGES (LB.) FOR SURVIVING EWES IN EACH GROUP FROM 16/10/57

Group	No. of ewes	Deaths	Weighing dates 1957 17/12	1958 28/1	28/2	25/3
Untreated	15	6*	—14	—26	—28	—37
Cobalt-bulleted	6	Nil	+9	+4	—3	+2

* 4 deaths from cobalt deficiency.

The Home Orchard in Summer

By D. W. McCALLUM,
Horticultural Instructor, Department of Agriculture, Blenheim

AT this time of the year the home orchardist will see prospects of a reward for his earlier efforts as pip, stone, and berry fruit develops. Many trees set far more fruit than they can readily develop and the very tightness of the fruit clusters creates a happy hunting ground for insect pests and promotes conditions favourable for the development of disease. This article discusses thinning of fruit and routine summer work in the orchard.

THERE are several reasons why thinning of tree fruits is desirable. Most important is that thinning maintains a balance between fruit development and vegetative growth. The first steps to achieve this balance are taken when the trees are pruned in winter.

Generally trees producing strong, vigorous new growth are pruned lightly to encourage fruit bud development, which in turn has a steadying effect on the subsequent growth of the tree. On the other hand trees producing weak growth but carrying a mass of fruit buds or spurs require to have these buds or spurs thinned out to stimulate vegetative growth and maintain the necessary balance. Similarly with fruit thinning in late spring and early summer, a very heavy crop requires considerable reduction, whereas a light crop may not require touching.

Thinning also increases fruit size and quality. With dessert apples this size increase may not be of great importance to the home orchardist, but the housewife will appreciate larger peaches, nectarines, plums, and apricots for bottling.

Thinning will give the opportunity to remove blemished and misshapen fruit and nutrients will be diverted to sound fruit.

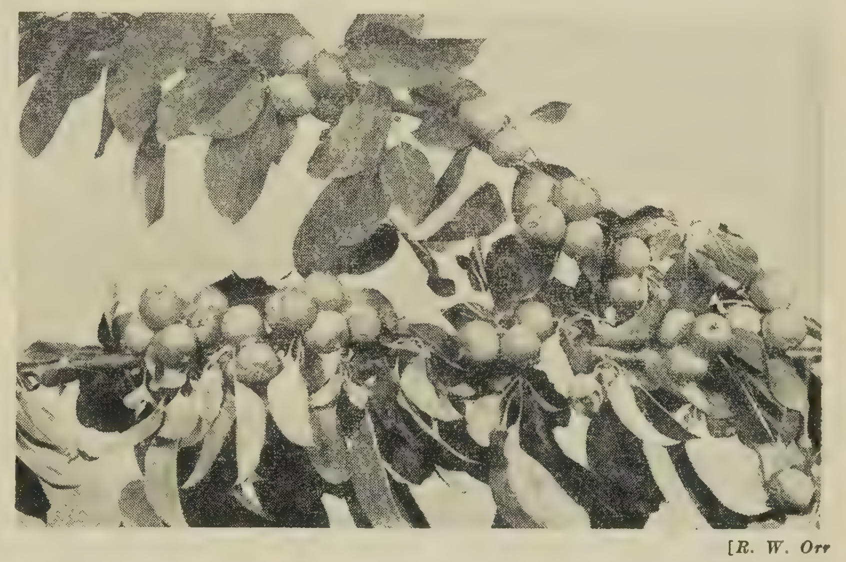
Some tree fruits, apples and pears in particular, have a tendency to crop more heavily in alternate years. This habit is normally not of great importance, but sometimes this alternate bearing (or biennial bearing as it is more properly called) becomes severe with a very heavy crop in the "on" years and practically nothing in the "off" years. This habit is not easy to stop. Hard pruning in the winter preceding the "on" year will assist, but will seldom cure the trouble. Thinning assists in regulating crops.

Brown rot of stone fruit is one of the diseases control of which may be obtained only by adequate thinning. The areas where fruit touch remain moist longer than those exposed and provide an excellent point of entry for brown rot. The leaf roller caterpillar, which hides its activities by spinning a web tying fruit and leaves together, finds conditions most suitable when fruits swell and grow in tight clusters. Finally a far better spray coverage is obtained when clusters have been opened up and the fruit spaced.

Apples

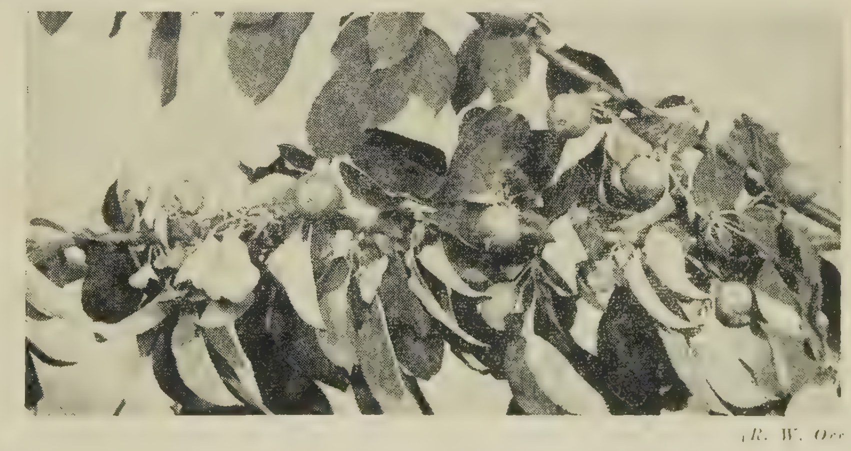
Some varieties of apples require more drastic thinning than others. Unless there is a particularly heavy crop which is liable to break down branches, naturally large varieties, such as Ballarat, are best left unthinned. Long-stemmed varieties, such as Golden Delicious and Rome Beauty, which are not particularly prone to biennial bearing, need less thinning than short-stemmed varieties such as Sturmer and Cox's Orange Pippin, in which there is a tendency for fruits to push each other off as they grow.

It is not possible to lay down a hard and fast rule as to just how much



[R. W. Orr

Section of an apple tree before thinning (above) and after thinning (below).



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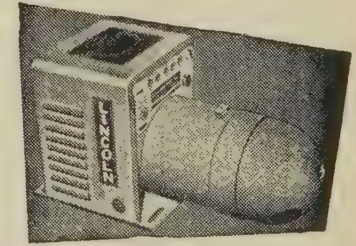

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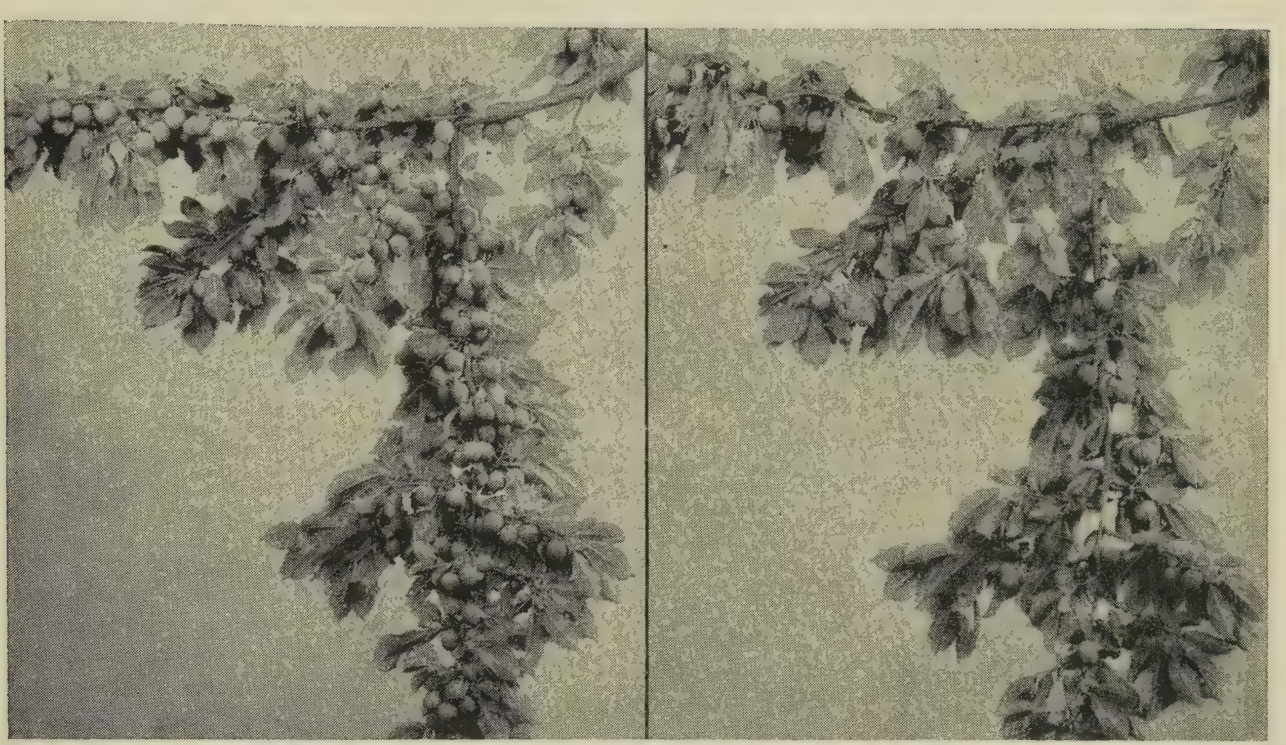

[*R. W. Orr*

Part of a Duffs Early Jewel plum tree before and after thinning.

fruit should be thinned off, but the following may be used as a guide:

Sturmer: Reduce fruit clusters to three fruits

Jonathan: Reduce fruit clusters to one or two fruits

Gravenstein: Reduce fruit clusters to two fruits

Cox's Orange: Reduce fruit clusters to three fruits

Delicious: Reduce fruit clusters to three or four fruits

Golden Delicious: Thinning not necessary unless an unusually heavy crop

Ballarat: Thinning not necessary unless an unusually heavy crop

There is a natural drop with most varieties of apples in late November and early December and thinning is best delayed until this is completed. Two thinnings are desirable for varieties maturing from March onward, a light thinning in December and a further one toward the end of January.

Fruit may be twisted off by hand, but as this tends to loosen the hold of other fruit in the cluster, additional dropping will probably occur. Thinning scissors are a sound investment; they cost very little and are useful for many tasks in the garden when light cutting is required.

Pears

Apart from the variety Winter Cole, which is reluctant to swell its fruit unless thinned, pears require thinning only where there is an exceptionally heavy crop. Again thinning scissors are best.

Apricots

Thinning is important with apricots. Rarely is a crop set evenly over the whole tree; more frequently there is a heavy set on some branches with well spaced fruit over the rest of the tree. Fruit clusters should be broken up as soon as the fruit is of sufficient size to handle and, ideally, fruit should be left so that no two fruits touch. Early and adequate thinning will materially assist the formation of flower buds for the following year's crop. The stems of apricots are too short for the use of thinning scissors, so they must be twisted off by hand.

Peaches and Nectarines

These fruit usually require thinning, particularly varieties maturing from mid January on. Early thinning is desirable and the number of fruits on each lateral reduced to three or four. Thinning is best done by hand.

ROUTINE WORK

Apples and Pears

Insect pests become more active from November, and routine spraying as suggested in the August issue of the "Journal" should be carefully carried out. Codling moth will be kept under control with the normal spray programme, but leaf hopper, woolly aphis, and red spider will probably require additional sprays. Malathion is suggested for these pests and should be applied as an additional spray between two routine sprays.

Early varieties such as Irish Peach, Red Astrakhan, and Beauty of Bath will mature soon after Christmas. These varieties do not keep and no attempt should be made to store them for long. Gravenstein and its red sports, Albany Beauty and Oratia Beauty, may be harvested during January and used for cooking. If the larger fruit are picked at this time, the smaller fruit remaining will develop in size and can be used for both dessert and culinary purposes in February.

Stone Fruit

Early varieties of all stone fruit will begin ripening from early December and should be harvested as they ripen. If they are left on the tree until they are too mature, brown rot is almost certain to develop. Mummified fruits, which are often found still on the tree after the harvest has been completed, are the result of brown rot and should be removed and burnt.

There is a tendency for the trees of early varieties to be neglected after the harvest is completed and this neglect is likely to have a bad effect on subsequent crops. Any treatment,

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such as watering, given to trees which have not yet ripened their fruit should also be given trees from which the fruit has been taken. In particular a watch should be kept for peach, plum, or cherry aphis and malathion or nicotine sulphate used if aphis is seen.

From January to March a small insect may be observed eating the surface tissue from the tops of cherry and plum leaves. The veins are left exposed and the network of fine brown veins is readily recognised. The insect, called the cherry or pear slug, has rather an unpleasant appearance somewhat like a small black slug with an enlarged head. It feeds only on the upper surface of the leaf and is readily controlled by any insecticide which it may be convenient to use.

Citrus

A watch should be kept for leaf roller caterpillar and scale. The caterpillar is an active little insect when disturbed and frequently drops to the ground on a silken thread. The main damage is the eating of the skin of the fruit, usually after binding a leaf to the fruit by spinning a web. Scales were described in detail in the May issue of the "Journal". Lead arsenate will control the caterpillar and summer oil the scale. These sprays may be combined.

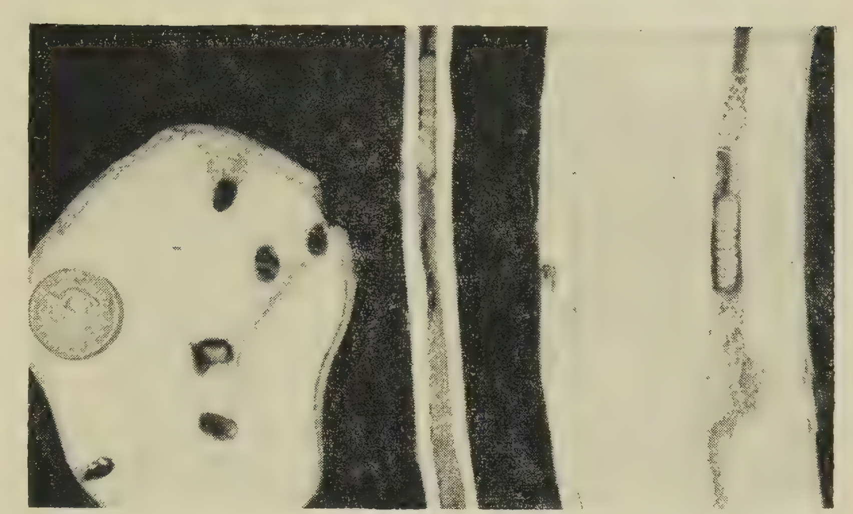
Young shoots about the thickness of a pencil may die back in December. This trouble is frequently caused by the larvae of the citrus borer (*Oemona hirta*), a native beetle which lays its eggs on the bark of branches and twigs. The larvae hatch in about a fortnight and burrow into the wood, feeding as they progress. The result is either the death of the infested part or unthrifty growth. Old wood and the trunks of the trees are also attacked, when dust resembling sawdust can be found in little heaps on the ground near the point of entry.

Control by spraying is not practicable, as the caterpillar is well protected by the wood of the tree. Young shoots which are affected should be cut off several inches beyond the obviously affected part. If the shoot is cut longitudinally, the grub will be found feeding inside. These shoots should be burnt after removal.

In older wood where pruning is not practicable probing the hole with a piece of sharpened wire may be successful in killing the grub. Another method is to inject petrol into the hole, which should then be plugged with a twig or soil. A pressure oil can is suitable for injecting the petrol.

Grapes

A vigorous vine produces an immense amount of growth which shades the developing fruit and provides conditions suitable for the development of disease. In addition good coverage with dusts and sprays is very difficult.



Transverse and longitudinal sections of lemon tree limbs, showing citrus borer larvae.

Fruiting laterals may be shortened to two or three leaves beyond the developing bunch and laterals which have no fruit showing may be removed unless they are required to replace existing rods or to develop new ones. Subsequent growth from the cut areas should be suppressed.

Berry Fruits

Harvesting will begin in December and, with some kinds, will finish in 2 or 3 weeks. In districts subject to strong, drying winds or to lengthy periods without rain crops of all berry fruits will suffer unless precautions are taken in ample time. Mulching will conserve moisture, and weed competition should be reduced to a minimum. Shelter from prevailing winds will not only ensure that the bulk of the fruit set will be harvested but will also improve the quality of the crop. This shelter need not be very dense; breaking the force of the wind is all that is required. A trellis is quite satisfactory.

Bushes should not be neglected after the harvest is completed. Mulches should be maintained and the plants watered if necessary. A watch should be kept for aphis and red spider and the bushes sprayed if these pests are found. Attention to details such as these in summer will assist in producing a good crop the following season.

Raspberries

Canes which have fruited will die and are best removed and burnt as soon as the crop is harvested. If new cane growth is excessive, their number could well be reduced at the same time. When this early pruning is carried out the remaining young canes, which will carry next year's crop, will grow more vigorously, and the incidence of pests, such as raspberry bud moth, will be reduced.

Strawberries

In the strawberry garden the first crop on young plants set out the previous winter may be disappointing, especially in colder districts. Generally this poor cropping may be put down to low soil temperatures at the time of planting, with the result that growth does not begin and the plants do not become established until late spring, too late for a crop in December. In such districts planting in March or early April would ensure establishment before winter sets in and the crop prospects would be much better.

If the December crop is missed or poor, varieties which set only one crop, such as Huxley, are unlikely to set a crop later in summer. Varieties which crop over a long period, Talisman, for example, will probably produce fruit from January provided soil moisture is maintained.

Black Currants

Black currants are usually harvested by picking the complete bunches of fruit from the bush and removing the individual berries from the bunches later. With this method it is difficult to avoid picking a small proportion of immature and useless fruit. However, harvesting the fruits individually as they ripen is not recommended, as many will be split by the pressure of the finger and thumb and delaying the harvest until all the fruit is ripe will mean harvesting much overmature fruit.

Two popular varieties, Goliath and Cotswold X, hold their fruit fairly well, but the best yields are obtained when most of the fruit is ripe and the bunches are picked at this stage and the immature fruit discarded.

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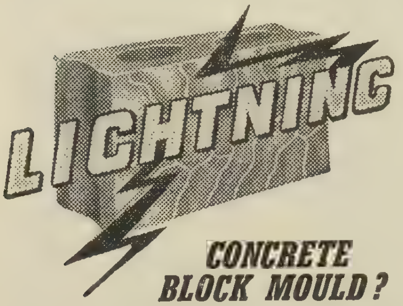

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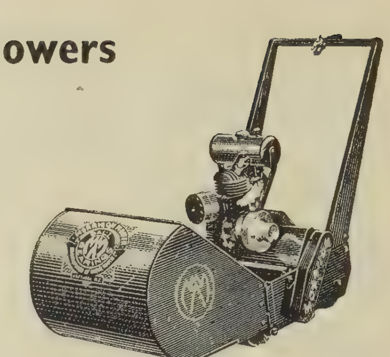

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Preparing for the Main Honey Flow

Seasonal Notes for the Domestic Beekeeper

By D. A. BRISCOE,
Apiary Instructor, Department of Agriculture, Tauranga

THE amount of surplus honey gained each season is governed largely by the amount of brood in the hive from 6 to 8 weeks before the main honey flow begins. Therefore, to ensure that a large force of field bees is available to gather honey when this main flow begins, careful planning of apiary work and correct management of colonies during the next few weeks are essential.

PERHAPS the two most important requirements during the active building-up period of the hive are good, young queens of desirable strain and vigour, and the availability of plenty of good comb space in the hive at all times in which to allow the brood nest to expand to maximum size.

Importance of Young Queens

It is most important that hives should have young queens early in the season. Hives coming out of the winter with ageing queens are slow in early brood rearing and will seldom build up to maximum strength in time for the flow. With young queens, however, provided the hives have plenty of comb space available, a minimum of attention is required until the hive is very populous, when normal manipulations are desirable before the flow begins.

Clogged Bee Combs Restrict Expansion

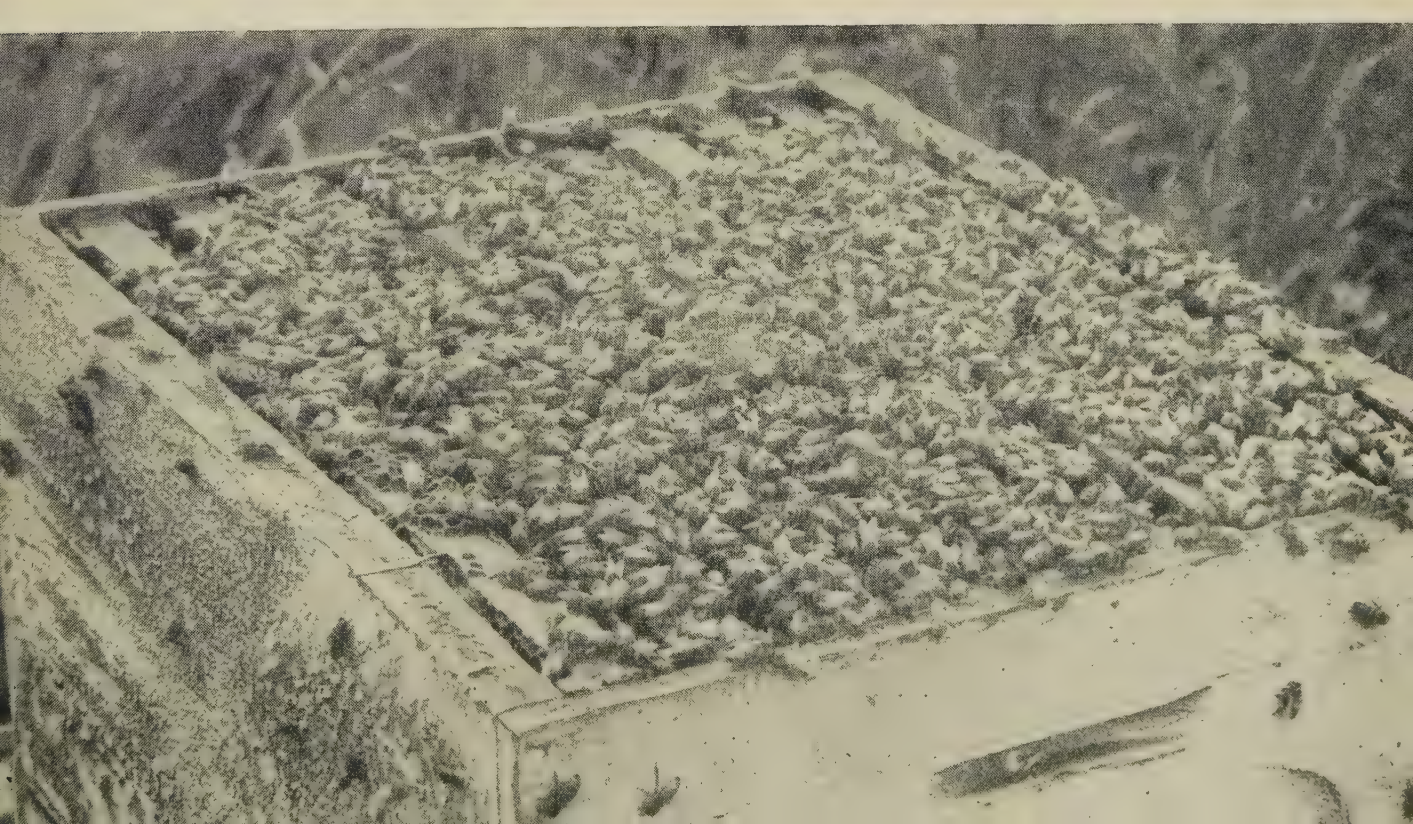
Other factors apart from an ageing or failing queen also have a bearing on the apparent slow progress of a hive. Bee combs clogged with either pollen or honey will often restrict the normal expansion of the brood nest. On the other hand such restriction may even be caused by reverse conditions, a shortage of pollen and stores. The domestic beekeeper must be aware of these possibilities. If combs clogged with honey or pollen are restricting the egg laying of the queen, two or three good brood combs should be exchanged for two or three clogged honey combs. These fresh combs should be placed in the brood nest area together and not at the sides of the super.

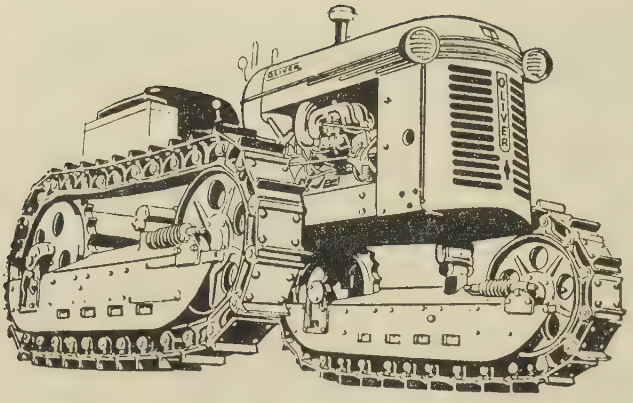
If there is a dearth of nectar and the hive is short of stores, a 50-50 sugar and water solution should be fed by a division board feeder or the ordinary tin feeder (a tin with several small holes punched in the lid) inserted over the combs of the brood nest. An empty super will be necessary to accommodate the tin feeder and keep it in place after the hive has been reassembled.

Pollen Shortage a Factor

Shortage of pollen can also be a cause of slow build-up in spring in some places. Where it is known that pollen shortages occur it may be necessary to feed a pollen supplement to offset this natural shortage or to tide the colony over until natural pollen becomes available. If a supplement is to be fed, it should be given to the hive before supplies of natural pollen are exhausted. If any further information on the feeding of a pollen supplement is required, or where it is thought that a natural shortage of pollen occurs, it would be wise to discuss the matter with the district Apiary Instructor.

▼ A good hive "boiling" with bees and ready for supering.





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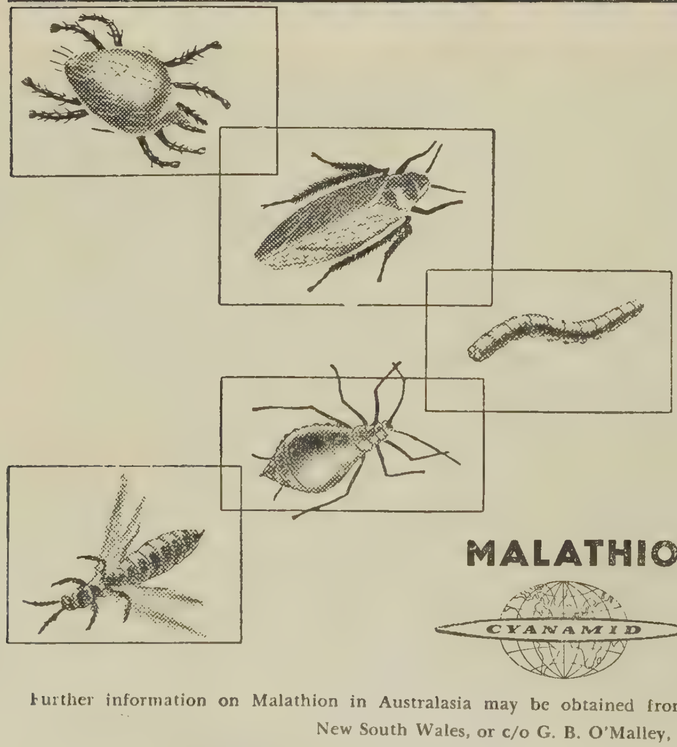

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Transference of Brood

The transferring of brood from one hive to another can sometimes be quite beneficial. Before this is done it is very important that the colonies concerned be thoroughly examined for any signs of American foul brood. Weak colonies may be stimulated with frames of brood from a strong hive to good advantage, as this not only helps the weak hive but also gives some swarm control in the too powerful colony.

Control of Swarming

Swarming is the natural means of propagation of the honey bee colony, but for honey production the beekeeper must try to keep swarming to the lowest possible level. Several factors contribute to cause swarming. The main ones are ageing queens, congestion in the brood nest, and insufficient hive ventilation. If these three points are kept in mind during the building-up period and corrective measures taken at the appropriate time, swarming should not prove troublesome.

Supering

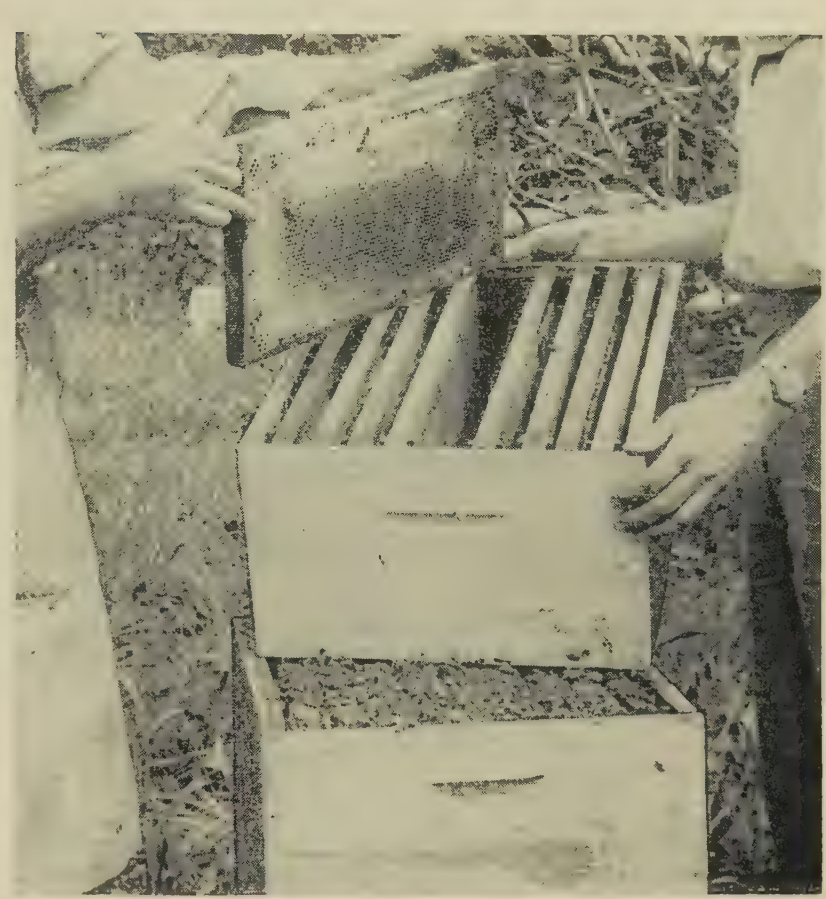
The supering of domestic colonies should not be done too far ahead of requirements. When there is evidence of the main honey flow beginning a super containing eight or nine combs should be given. If the honey flow is heavy, eight combs to the super are an advantage. This number ensures fatter combs of honey, which are easier to uncap and extract. If the eight combs are evenly spaced, there is little risk of burr comb being built, unless storage space for the incoming nectar is very restricted.

Additional supers of combs should always be given just slightly ahead of requirements. Where supers of foundation only are given it is an advantage to assist or encourage the bees to enter the super without delay. This can be accomplished by the use of a bait frame (a comb already drawn out) or an outside frame of honey taken from the brood nest below. At times the bees are a little reluctant to enter supers of straight foundation and a little encouragement with one or two bait combs is desirable.

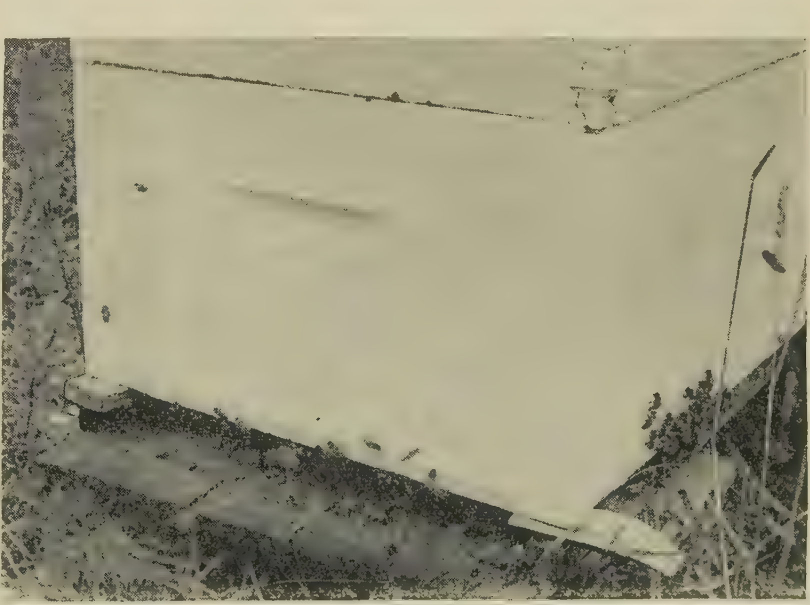
It is not unusual for queens to find their way into the top honey supers and lay eggs in the centre combs. Provided all brood in the top supers is placed down into the brood nest and the combs are replaced with a similar number containing honey from the boxes below, there is rarely much further trouble from this cause once the honey flow has begun.

Where queen excluders are preferred these may be placed in position at the same time as the honey supers are added.

Photographs by Rendells



Adding a super of combs. The bait comb with a little honey in it was taken from the outside of the super below.



Plenty of ventilation is necessary at this time of the year. It is a good idea to prop the hive up off the bottom board with a couple of blocks of wood about 1 in. thick.

Care of Livestock during December

[*Niederer*

▲ Handling of sheep in foot-rot control being demonstrated by C. R. Ensor, Veterinarian, Department of Agriculture, Whangarei, at the Farmers' Conference Week at Ruakura in 1957.

Contributed by the Animal Research Division

CARE OF EWES AND FAT LAMBS

As each lot of lambs is sold their mothers and any dry ewes that may remain in the flock should be drafted off. If feed is short and the ewes have very little milk, it usually pays to wean all the lambs, which can then be given the best grazing available. The ewes should be shorn and those which are to be retained should be placed on short pasture with ample water until flushing is started 3 weeks before tupping. This will help to reduce their condition and will result in a better lambing percentage in the following season.

SHEARING

If ewes with lambs are to be shorn, every effort must be made to reduce the time during which lambs are away from the ewes, as it is easy to dry ewes off at this time of the year. They should be brought to the shed in small mobs and should be dagged before reaching the board.

FOOT-ROT CAN BE ERADICATED

This is the season in which plans for the eradication of foot-rot must be made and farmers should follow the recommendations in "Journal" articles on this subject and in Bulletin No. 325, "Foot-rot in Sheep can be Eradicated".

DAIRY COW NUTRITION

The year's production can be materially affected by feed conditions during summer. Cows fed poorly now not only produce less milk during summer, but will dry off earlier in autumn. Dairy statistics show that long lactation is very important, so the feeding of silage or other supplementary milk-producing fodders should be started as soon as pasture begins to dry off. This should not be left until milk production shows a material fall.

PIG PRODUCTION

Farrowed sows should receive a ration of 4 gallons of milk plus 2/3 gallon per pig suckled. Newly weaned pigs should not be overfed; 1½ to 2 gallons per day in three feeds is adequate for the first 14 days. The ration can then be slowly raised to 2½ gallons at the end of the first month, and after the first fortnight the number of feeds may be reduced to two per day.

Replacement breeding stock should be selected from the bacon pens. Those chosen should be the fastest-growing sows with good strong feet and at least 12 well placed teats.

COWS RETURNING TO THE BULL

If cows are returning to service, the mating records should be examined to see if any particular bull is to blame. If so, a veterinarian or Livestock Instructor should collect a semen sample for examination. Care is necessary when a replacement bull is bought, and if possible it should be a young bull that has not been used previously. A bull should never be bought in the saleyard unless his full history is known. Washing out cows seldom helps and may cause trouble if irritant fluids such as kerosene are used. It pays to consult a veterinarian as soon as the cows are noticed returning to service in unusual numbers; he cannot be expected to diagnose the trouble months later.

LEPTOSPIROSIS IN CATTLE

Infection with *Leptospira pomona* can cause abortion in cattle and redwater in calves. Both of these disease conditions may be prevented by vaccination of the pregnant cow. Cows vaccinated early in pregnancy and again about 2 to 4 weeks before calving may be protected against this particular type of abortion and at the same time protection may be conferred on the calf against redwater through the colostrum. A veterinary surgeon should be consulted to establish a diagnosis of leptospirosis and to undertake control measures.

Grass and Clover Seed Production

Seasonal Notes by the Extension Division

THE production of grass and clover seeds, particularly of the improved strains, is an essential link in the continuing pasture renewal programme. Care in the management of seed-producing areas at and before closing is reflected in both the quality and quantity of the seed produced from them.

RED CLOVER SEED PRODUCTION

THE management of red clover for seed production should be varied to suit seasonal conditions and the variety of clover involved. With cowgrass it is normal to take a cut of hay before closing for seed, but with Montgomery red clover the spring growth is usually controlled by grazing. However, some areas of Montgomery red clover on heavy land are also sometimes cut for hay before they are closed for seed.

Cowgrass, producing earlier spring growth than Montgomery red clover, yields a heavier hay crop by the end of November or early December, when areas should be cut and closed for seed harvest. Earlier cutting than this may be necessary in dry seasons when growth is not so good, and in some districts cutting in late October may sometimes be necessary.

Grazing of Montgomery red clover, which is normally carried out with sheep, should be light in early spring but heavy when vigorous growth begins. This heavy grazing should be maintained to the time of closing for seed, as an unevenly grazed stand at closing will result in uneven maturing of the seed crop. Depending on seasonal growth, stands should be closed to grazing from about mid November in dry seasons to mid December in seasons of vigorous growth. Closing to grazing or haying much after mid December cannot be recommended, as the crop must have time to set seed fully before cooler weather sets in toward the end of March. Topping with a mower may be resorted to after closing when preferential grazing has resulted in uneven growth.

—*J. P. BEGGS*

* * *

WHITE CLOVER SEED PRODUCTION

THE best white clover seed crops are produced from areas of medium fertility. More crops are failures through too much leaf growth than too little. Because of attacks by clover case bearer second-year paddocks are a better proposition than older areas. The area to be saved should be closely grazed in winter and early spring. This management tends to give a dense, even sward of clover that will produce plenty of flower buds. It also has the advantage of depressing the grass species present. The usual time for closing is early November when the first few flowers are showing. Where excessive growth is likely to be a problem, closing should be delayed a week or more.

—*B. J. McSWEENEY*

* * *

BLIND SEED DISEASE

THE economic importance of blind seed disease of ryegrass and the value of pre-harvest testing are revealed by the summary of test results obtained at the Seed-testing Sub-station, Timaru, during the 1957-58 harvest.

Of 1,920 South Island crop samples tested 454 crops (or 23.7 per cent) might have germinated 90 per cent or better; 824 (42.9 per cent) between 60 and 90 per cent, while 605 crops (31.5 per cent) might have germinated less than 60 per cent.

Blind seed disease is caused by a fungus which produces vast quantities of minute spores about the time ryegrass is in flower and these are projected upward into the air to settle on the ryegrass florets. Spores can travel through a standing crop and infect a large number of heads, but in a heavy, lodged crop they are confined on or near the ground.

If the weather is damp and warm, these windborne spores infect the developing seed with the disease, resulting in its inability to germinate later. If the weather is dry and hot during the flowering period of the grass, most of these spores die, even if they have settled on the florets. When this happens the life cycle of the disease is broken.

CONTROL Some measure of control can be obtained by taking the following precautions:

1. Aim to produce a vigorous stand and a lodged crop. The use of nitrogen has this effect and also increases yields.
2. Shut up for seed early.
3. Sow on a fallow, preferably not grass to grass.
4. Sow only the highest germinating lines of seed procurable to minimise primary infection of seed crops.
5. Pre-harvest test the crop so that you will not harvest useless produce.

—*H. A. ARTHUR*

* * *

SUMMER IRRIGATION OF PASTURE

ESTABLISHED pasture may, with the onset of dry weather, rapidly deplete reserves of moisture built up over winter. While it is seldom necessary to irrigate before October or usually November, where the stocking rate is high and pastures carry little surplus growth it is important not to delay irrigation until growth is severely checked. In the extreme where pasture is allowed to brown off, one irrigation will only cause it to green up; a second application is necessary to produce feed. With limited water available it is difficult in continued dry weather to restore such pasture to full production. Newly sown pastures are less susceptible to drought, and irrigation of these should be confined to preventing the onset of permanent wilting.

IRRIGATING LUCERNE IN SUMMER

Lucerne requires more careful irrigation than grass/clover pasture. Restricted watering helps to prolong the useful life of the stand without seriously reducing hay yields. Normally two good cuts can be obtained without irrigation, and generally only one irrigation after the second cut and another after the third are required. In very dry summers additional irrigations midway between the second and third and third and fourth cuts are necessary for high yields.

SUMMER IRRIGATION OF CROPS

All the annual crops barley, turnips, swedes, chou moellier, kale, and rape respond satisfactorily to well timed irrigations. Wheat is much less responsive, and irrigation of this crop does not usually give a worth-while return. Oats, linseed, and peas are other crops known to have given good responses to irrigation, but little experience with these crops has yet been obtained. The chief point with annual crops is to avoid surface irrigation at the seedling stage; otherwise permanent damage to the crop from waterlogging can result. Seed crops of both red and white clover respond well to irrigation in dry summers. The most effective time of application is probably when the seed heads are filling.

—*B. A. LAUDER*

POTATO MANURIAL TRIALS

IN the 1956-57 season a potato manurial trial was conducted by the Department of Agriculture's Invermay Research Station on an alluvial silt loam of the Taieri Plains. Results show table and seed yield increases arising from different levels of phosphate, nitrogen, and potash applied separately and in combination. In cooperation with the Otago University School of Home Science a tasting test for consumer preference was made comparing tubers from "no potash" and "potash treated" plots.

TRIAL DETAILS

A TWO-REPLICATE multi-factor layout was used, consisting of 54 plots divided into 6 sub-blocks. Three 15 ft. rows each containing 12 tubers formed a plot.

The treatments were: superphosphate, 0, 3 cwt., and 6 cwt. per acre; sulphate of ammonia, 0, 1 cwt., and 2 cwt. per acre; and muriate of potash, 0, 1 cwt., and 2 cwt. per acre. The variety sown was Sebago.

The trial area had a previous topdressing history of 2 cwt. of superphosphate per acre per annum. A soil test showed the soil moderately acid with medium phosphate, calcium, and potash levels.

THE CROP

Germination was rather slow and variable, possibly owing to *Corticium* infection, but germination counts failed to show any significant difference between treatments. Inspection of the crop foliage and tubers did not reveal any other disease or virus infection.

YIELD RESULTS

A high yielding crop was obtained, with total yields ranging from 16 to 21 tons per acre.

MAIN EFFECTS OF APPLIED FERTILISERS (IN TONS PER ACRE)

	Table	Seed
Yield without superphosphate	14.60	1.50
Difference due to 3 cwt. of superphosphate ..	1.73*	0.39†
Difference due to 6 cwt. of superphosphate ..	2.79*	0.57*
Yield without sulphate of ammonia	15.04	1.75
Difference due to 1 cwt. of sulphate of ammonia	1.20	0.16
Difference due to 2 cwt. of sulphate of ammonia	2.01*	0.05
Yield without potash	15.54	2.03
Difference due to 1 cwt. of potash	0.56	—0.29
Difference due to 2 cwt. of potash	1.15	—0.34†

* Significant at 1 per cent level

† Significant at 5 per cent level

The differences are all increases with the exception of seed yield reductions with 1 and 2 cwt. of potash.

It must be emphasised that the yields given above are "main effects". A study of some significant interactions which occurred between applied fertilisers shows that the "main effects" in themselves do not give a complete account of the fertiliser responses in this trial.

SIGNIFICANT INTERACTIONS

1. Between superphosphate and potash: The table yields of the various combinations of superphosphate and potash show that neither superphosphate nor potash caused any increase in yield if used without each other.

TABLE YIELDS IN TONS PER ACRE

		Superphosphate		
		0	3 cwt.	6 cwt.
Potash	0	15.1	15.8	15.7
	1 cwt.	14.7	15.8	17.8
	2 cwt.	14.0	17.4	18.7

It can be seen that there was no appreciable yield increase except with the following combinations: 2 cwt. of potash and 3 cwt. of superphosphate; 1 cwt. of potash and 6 cwt. of superphosphate; and 2 cwt. of potash and 6 cwt. of superphosphate. The last combination gave the highest yields.

2. Between superphosphate and sulphate of ammonia: The interaction table shows that when these two fertilisers were used without each other (a) sulphate of ammonia was ineffective even at 2 cwt. per acre; (b) the rate of 6 cwt. of superphosphate was required before there was a yield increase.

TABLE YIELDS IN TONS PER ACRE

		Superphosphate		
		0	3 cwt.	6 cwt.
Sulphate of ammonia ..	0 ..	14.3	14.6	16.3
	1 cwt. ..	14.9	16.1	17.8
	2 cwt. ..	14.7	18.4	18.1

When the two fertilisers were used in combination 1 cwt. of sulphate of ammonia and 3 cwt. of superphosphate equalled the yield from 6 cwt. of superphosphate. The yield from 6 cwt. of superphosphate was enhanced by the addition of 1 cwt. of sulphate of ammonia, but there was no additional benefit from 6 cwt. of superphosphate compared with 3 cwt. of superphosphate when both were applied with 2 cwt. of sulphate of ammonia.

TASTING TEST

This section of the work gave inconclusive results, as the ability of an individual taster to give similar results from morning to afternoon was so weak that the chances of any results being significant were ruled out. The conclusions drawn were either that taste differences (if they existed) were too small to be detected or that a person's taste preference can change considerably with time.

The tasting test for consumer preference failed to detect any difference between potatoes grown with and without potash fertiliser.

—*R. S. SCOTT*

Footnote: This trial was one of a series of 38 similar experiments conducted in the years 1952 to 1957 inclusive in the main potato-growing districts in New Zealand. The full results from this project await final analysis. A progress report on the project was given in the "Journal" for August 1956, page 133.

Control of Blackhead in Pullets

No Adverse Effects with Third Drug Tested

OUTBREAKS of blackhead infection (entero-hepatitis) in chickens have become more frequent in recent years and the importance of having a drug suitable to control this disease has increased. Some of the drugs which have proved satisfactory for controlling blackhead have also had undesirable effects on birds when they reached maturity. Three drugs recommended for treating chickens for blackhead have been tested by the Department during the past 3 years. In this article J. Edmondson, Poultry Experimentalist, Department of Agriculture's Poultry Demonstration Plant, Upper Hutt, reports on a trial with nithiazide, the third drug tested, which was shown to have no adverse effect on sexual maturity and egg production when fed to 13-weeks-old Australorp pullets. The drug is obtainable in New Zealand under the proprietary name "Heptas".

AN investigation at the Poultry Demonstration Plant at Upper Hutt showed that the drug "Entramin" (2-amino, 5-nitrothiazole), though satisfactory for controlling outbreaks of blackhead in chickens, had a marked detrimental effect on sexual maturity and subsequent rate of lay. A report of this work appeared in the September 1956 issue of "The New Zealand Journal of Agriculture". "Entramin" was withdrawn from the market and "Entramin A" was sold as an alternative.

TABLE 1—FOOD CONSUMPTION

Weeks of age	Group 1 (Control) (lb.)	Group 2 .0125 per cent (lb.)	Group 3 .025 per cent (lb.)	Group 4 .05 per cent (lb.)
13 to 14 ..	58	65*	60*	59*
14 to 16 ..	127	130*	130	130
16 to 18 ..	136	130*	139	150
18 to 20 ..	159	149*	145	159
20 to 22 ..	178	180*	181	176
22 to 24 ..	173	166*	174	149
24 to 26 ..	153	172*	158	163

* Drug treatment period

TABLE 2—BODY-WEIGHT GAIN

Weeks of age	Group 1 (Control) (lb.)	Group 2 .0125 per cent (lb.)	Group 3 .025 per cent (lb.)	Group 4 .05 per cent (lb.)
13 to 14 ..	12	11*	12*	16*
14 to 16 ..	19	23*	17	23
16 to 18 ..	19	21*	23	20
18 to 20 ..	20	21*	20	20
20 to 22 ..	22	24*	21	20
22 to 24 ..	22	22*	22	16
24 to 26 ..	15	14*	13	15

* Drug treatment period

"Entramin A" (acetamidonitrothiazole) was then similarly tested and a report was published in the November 1957 issue of the "Journal". Though adverse effects on sexual maturity and egg production were not as great as those obtained with the use of "Entramin", the results when the drug was fed to healthy chicks demonstrated the need for caution when using it to control blackhead.

As a result of these studies it was decided to continue this line of investigation, and because of promising results from work overseas a drug, nithiazide, was obtained for testing.

Procedure

The Australorp pullets used in this investigation were all of one hatch bred from a mass-mated flock of hens at the Poultry Demonstration Plant. They were floor brooded and housed intensively for the duration of the test. When the pullets were 6 weeks old they were placed in four groups, each group consisting of two separate lots of 30 chicks. This number was reduced to two lots of 25 chickens per group at 13 weeks of age, when dietary test levels of nithiazide were introduced.

The following all-mash ration was introduced when the birds were 6 weeks old and remained unaltered until they were 40 weeks old, when the test was concluded:

	lb.
Dehydrated lucerne	5
Bran	5
Pollard	10
Ground wheat (coarse) ..	36¼
Ground maize	10
Ground barley	20
Meat meal (60 per cent) ..	6
Dried buttermilk powder ..	4
Ground oyster shell	2
Vitamin A and D3 pre-mix ..	1¼
Manganised salt	½

To this basic formula dietary levels of nithiazide were added as follows:

Group 1: Control

Group 2: .0125 per cent—continuous from 13 weeks of age

Group 3: .025 per cent—for 7 days from 13 weeks of age

Group 4: .05 per cent—for 7 days from 13 weeks of age

Records were kept of food consumption, body-weight gain, egg production, and mortality to 40 weeks of age.

Artificial lighting was not used at any time and food and water intakes were not controlled.

Food Consumption and Body-weight Gain

Tables 1 and 2 show that nithiazide at the levels used had no detrimental effect on food consumption or rate of body-weight gain when compared with the controls in Group 1.

Sexual Maturity and Egg Production

Table 3 shows the age at which each group began to lay and also the subsequent pattern of weekly egg production computed as a percentage on a bird-day basis.

Table 4 indicates age at sexual maturity and also the rate of lay from

TABLE 4—SUMMARY OF SEXUAL MATURITY AND EGG PRODUCTION TO 40 WEEKS OF AGE

	Group 1 (Control)	Group 2 .0125 per cent	Group 3 .025 per cent	Group 4 .05 per cent
Sexual maturity (weeks of age)	23	24	23	24
Average per cent production	45	42	46	51
Average eggs per bird ..	53	47	56	56

TABLE 3—SEXUAL MATURITY AND EGG PRODUCTION

(Percentage Weekly Egg Production (Bird-day Average))

Groups	Level	Dosage from 13 weeks of age Duration	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
			(Weeks of age)																	
1.	Control	Control ..	2	3	10	19	26	39	47	52	53	53	58	57	61	63	62	57	50	48
2.	.0125 per cent ..	Continuous ..	—*	1*	5*	6*	12*	20*	31*	36*	44*	55*	66*	63*	60	62	64	52	48	48
3.	.025 per cent ..	7 days ..	1	1	3	8	18	24	36	45	53	62	60	68	71	72	68	66	67	67
4.	.05 per cent ..	7 days ..	—	1	4	10	20	31	42	53	63	67	71	75	78	72	61	50	50	59

* Drug treatment period

the time the birds in a group began to lay to 40 weeks of age. Either delay in sexual maturity or a reduced rate of egg production can affect the economic value of laying birds and consequently for this study there must be clear differentiation between the two factors. However, the practical poultry farmer is concerned with the overall effect on economic egg production. Table 4 also gives the average number of eggs laid per bird to 40 weeks of age and enables assessment of the combined influence of sexual maturity and rate of lay.

Pullets fed a dietary level of .0125 per cent of nithiazide from 13 weeks of age to 34 weeks of age (when supplies of the drug were depleted) came into lay 1 week later than the controls. They laid at a 3 per cent lower rate and averaged 6 eggs per bird less than the controls up to 40 weeks of age.

Groups 3 and 4, receiving higher levels of nithiazide for a period of 7 days from 13 weeks of age, each registered a slightly higher rate of production than the controls and both laid an average of 3 eggs per bird more.

Results Satisfactory

The results of the investigation demonstrate that nithiazide when used at a level of .0125 per cent in the food for a protracted period showed a slight effect on economic egg production.

When used at the higher levels of .025 per cent and .05 per cent at 13 weeks of age for a period of 7 days results obtained were as good as if not better than those of the controls.

This study was not concerned with the efficacy of nithiazide for the treatment of blackhead, but was an investigation into the possible effect of nithiazide on disease-free chickens. Field tests carried out overseas and supported by limited tests in New Zealand have established that outbreaks of blackhead in turkeys can be successfully controlled by treatment at .02 per cent level in the drinking water or .025 per cent level in the food for about 4 days.

Blackhead in chickens has also been successfully controlled in New Zealand with this drug.

A level of .0125 per cent of nithiazide in the food has been found an effective preventive.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given during December as follows:

1YA Auckland, 7.45 p.m.

3 December—Talk by officer of Animal Industry Division, Department of Agriculture, Auckland.

10 December—"Lessons of the Past Year", by E. H. Arnold, Assistant Fields Superintendent, Department of Agriculture, Auckland.

1YZ Rotorua, 7.15 p.m.

10 December—"Current Work on Pumice Country Farms", by C. R. Taylor, Instructor in Agriculture, Department of Agriculture, Rotorua.

2XG Gisborne, 8 p.m.

9 December—"For the Poverty Bay Orchardist", by J. D. Overbye, Horticultural Instructor, Department of Agriculture, Gisborne.

2XA Wanganui, 8 p.m.

4 December—"For the Country Woman", by Mary MacDonald.

11 December—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

18 December—"Carpet Beetle in Wool", by P. C. Marshall, Sheep and Wool Instructor, Department of Agriculture, Wanganui.

2YZ Napier, 7.10 p.m.

2 December—"Cooling of Milk and Cream", by L. W. Scott, Farm Dairy Instructor, Department of Agriculture, Hastings.

16 December—"Farming Editor's Summary", by R. G. Montgomery, Sheep and Wool Instructor, Department of Agriculture, Hastings.

2ZA Palmerston North, 12.33 p.m.

8 December—"Brands and Branding", by C. R. M. Jones, Livestock Instructor, Department of Agriculture, Dannevirke.

22 December—"Soil Fumigation for Outdoor Crops", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Palmerston North.

3YA Christchurch, 12.20 p.m.

1 December—"Lucerne", by R. G. Jolly, Instructor in Agriculture, Department of Agriculture, Christchurch.

15 December—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.33 p.m.

1 December—"Contour Farming", by W. O. Sly, Soil Conservator, Department of Agriculture, Invercargill.

8 December—"Silage", by T. W. Tothill, Fields Instructor, Department of Agriculture, Dunedin.

15 December—"Review of 1958", by A. G. Elliott, Fields Superintendent, and D. H. Le Souef, Livestock Superintendent, both of the Department of Agriculture, Dunedin.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8 p.m. (Northland livestock report and "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 8 p.m. ("News for the Farmer").

1YA Auckland, Mondays at 12.33 p.m., Tuesdays, Wednesdays, and Thursdays at 7.45 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m., Thursdays at 12.33 p.m.

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m. and 6.50 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m. Tuesdays at 12.33 p.m. and 7.15 p.m. (Lorneville and Gore stock market reports), Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m.

Main Wool Sales

The dates and venues of main wool sales until the end of March are:

22 and 24 October: Dunedin.
30 October and 1 November: Christchurch.
10 November: Auckland.
14 November: Wanganui.
19 and 21 November: Napier.
26 November: Wellington.
5 December: Christchurch.
10 December: Invercargill.
15 December: Dunedin.
19 December: Timaru.
9 January: Wanganui.
14 and 16 January: Auckland.
21 and 23 January: Napier.
28 and 30 January: Wellington.
9 and 11 February: Christchurch.
16 and 18 February: Invercargill.
23 and 25 February: Dunedin.
2 March: Timaru.
11 March: Wanganui.
16 and 18 March: Auckland.
23 and 25 March: Napier.

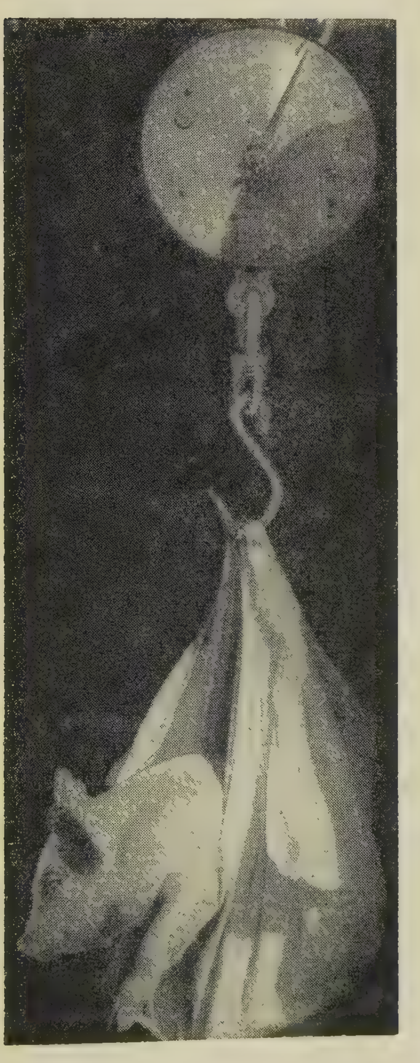
Outstanding Large White Litter of 18 Pigs

By the Animal Industry Division,
Department of Agriculture

THE Large White is a notably prolific breed of pig, but it is not often that litters as large as 18 born are reared without a single loss. This was the performance of the sow Bathurst Countess (13623) belonging to Mr J. B. Julian, Kakaramea, South Taranaki, and it reflects great credit on the standard of pig husbandry on the farm, which is managed by Mr Russell Julian.

THE litter, born on 12 February 1958, was divided into two lots of 9 pigs each and for the first few days each lot was allowed access to the sow for an hour alternately. While away from the sow the piglets were put in a fenced-off corner of the farrowing house under a bright emitter infrared heat lamp and a little new milk and piglet starter dry meal were offered in low troughs.

[Paul



▲ The litter photographed in the yard of their house at 8 weeks of age.

← Born at 3½ lb. (less than half the weight of an average child), this piglet reached 13 lb. at 3 weeks and 42 lb. at 8 weeks. At 6 months he was heavier than an adult man.

At a week old the two halves of the litter were accommodated in separate houses and the sow run with each group alternately for 1 to 2 hours at a time. The 9 pigs away from the mother always had access to special dry starter feed in a low trough and fresh whole milk in another.

The provision of accommodation for the division of the litter, of artificial heat, and of the right kind of starter feed is regarded by Mr Julian as fundamental to the success of rearing such a large litter on one sow. Any stale food left was removed and all troughs were cleaned before the next feed was put in, and careful attention was given to the sow's diet before, and for the first month after, farrowing in particular.

The sow was accommodated in an 8 ft. x 8 ft. wooden farrowing house with concrete yard giving access to a good grass run. Whey, which is the basic food supply on this farm, was fed in carefully regulated quantity and supplemented by a barley meal/meat meal mixture in addition to grazing. Conditions were typical of those in other good, practical farm piggeries in New Zealand.

The litter was weighed weekly during the first 8 weeks and though individual pig weights at birth were somewhat below average (which, of course, makes the rearing of all the litter the more creditable), the piglets averaged 10½ lb. at 3 weeks (total 190 lb.) and went on to wean at 8 weeks at just under 39 lb. per head (698 lb. total litter weight).

The remarkable evenness of the litter is evident from the photograph taken at 8 weeks. An average of close on 40 lb. is regarded as satisfactory under farm conditions for litters of 8 or 9 pigs. Thus, not only is this an example of good pig husbandry but it illustrates how the cost of weaner production can be reduced by the use of prolific sows if the management can exploit this superior prolificacy.

Carcass Test Results

The litter was recorded under the Pedigree Pig Improvement Scheme and 2 pigs were slaughtered on 16 September. They averaged 90 lb. dressed, which gives a score of nil points for growth rate and 80 points for carcass, an overall total of 64 per cent of possible.

The reason for the low growth rate was that the main growth period coincided with the scarcity of whey during winter.

Common Misconceptions about Artificial Breeding

SOME common misconceptions about artificial breeding revealed by farmers' statements at meetings and during visits to the New Zealand Dairy Board's Artificial Breeding Centre at Newstead were dealt with by J. P. James, Director of Artificial Breeding, New Zealand Dairy Board, at the 1958 Ruakura Farmers' Conference Week. An adaptation of the paper he presented follows.

THOUGH artificial breeding has been practised in most dairying countries for nearly 20 years and has recently been gaining ground rapidly in New Zealand, one still hears views expressed or questions asked about some aspects of the work which suggest a very poor appreciation of the advances that have been made in this subject during the past two decades. It is very satisfactory from our viewpoint that with the rapid expansion of this work that has been taking place during the past few years the Dairy Board has been able to collect and analyse data covering a good many of the questions raised, so that our views can be supported by facts.

Some of the matters raised may appear to some who have been using A.B. in their herds for some years as trivial and hardly worth bringing forward for discussion. The fact that hardly a week passes without some inquiry, being made about these matters by farmers wishing to join the A.B. scheme seems to make it necessary to include everything at the risk of covering much familiar ground for those who have some experience of the results.

Dr James.

Unfortunately, incorrect statements about the effects of A.B. are sometimes made at meetings or in casual conversations between farmers and these often do a great deal to undermine the confidence of those inexperienced in the scheme. I therefore appeal to any farmer who has doubts about the operation of the scheme or the results to get in touch with his local herd improvement organisation or with the Newstead Breeding Centre.

1. A.B. stock are inferior to those bred naturally.

Without doubt this is the most common misconception about artificial breeding. The question may be raised in several forms; for instance, present A.B. stock may appear sound in every respect, but what about future generations?

Doubts about the appearance, vigour, growth, and performance of present A.B. stock can be answered very definitely, because we have now an enormous amount of evidence to prove that they are normal in every respect. Many farmers have visited Newstead and had the opportunity of comparing two groups of A.B. yearling bulls with two groups of naturally bred. He would be a bold judge who would be prepared to stake much on his ability to pick out each class from a mixed group. The number of times that experienced breeders have failed on this one should be a warning to any who think they would like to try.

Apart from this visual evidence, whose value everyone can test for himself, surely if A.B. produced unthrifty or abnormal stock, its progress in countries such as England, Denmark, and the U.S.A. would not have been so widespread and persistent in the past 15 to 20 years. Enough time has elapsed for breeders to judge the development and performance of those early progeny of A.B. and to decide for themselves whether they intended to continue using the service.

It is hard to imagine that had any weaknesses in conformation, vigour, or performance been apparent—and I think we must agree that a lot of people would be looking very closely for such defects—countries which have prided themselves on their stock judgment would continue to use A.B. on such an increasing scale that today 96 per cent of all cows are artificially bred in Denmark, 57 per cent in England, and 27 per cent in America.

On the production side—and the results here are the acid test as far as we are concerned—all the evidence collected so far, and this is getting very large now, shows that A.B. heifers are outproducing naturally mated ones in the same herds by 18 lb. of fat for merit sires and 6 lb. for all unproved bulls.

I cannot find any factual evidence that A.B. cattle are inferior in any way to naturally bred ones, and all the evidence in this country shows them to be better producers.

An extension of the same theme that is also frequently expressed is that though deleterious effects may not be apparent in these early generations of A.B. stock, future generations will show deterioration in stamina, fertility, and productivity. Admittedly there has not been sufficient time yet to give many figures from New Zealand experience in this direction, but there are herds in this district [Waikato] which have been using artificial breeding consistently since 1943, with marked improvement in production, no loss in stamina, and with fertility at such a level that no bull is kept for use on the main herd. A.B. has been extensively used in Denmark since 1938 and in Russia for 5 years longer. I have not seen one report which suggests that there is any deterioration in the A.B. stock in those countries.

2. Greater numbers of abnormal calves are born in A.B. herds.

This may be regarded as a further extension of the previous misconception in that though the bulk of cattle may be normal, the losses from abnormal calves are greater and are not taken into account when considering mature animals.

It is unfortunate that it is virtually impossible to get accurate information about the extent of abnormal births in naturally mated herds. As a result a lot of very valuable information about the distribution and types of abnormalities occurring is lost to the industry. Breeders are reluctant to give information about abnormal births in their own herds, and commercial dairymen are generally resigned to accept a few abnormal births as part of the risks of dairying without saying very much about it.

This reticence does not apply to A.B. stock, and we feel that we have a fairly complete picture of the numbers

▲ A.B. bulls at Newstead.

and types of the abnormal calves born out of just over 69,000 A.B. calvings. In a recent analysis of these births which was undertaken by the Herd Improvement Department of the New Zealand Dairy Board to obtain sex ratios and other information the opportunity was taken to plot the abnormal calves from each of the bulls at the Newstead bull centre. From this survey there were 248 abnormal calves from a total of 69,047 calvings, which represents just over three such births per thousand calvings. It is a very low figure, particularly when this total includes calves classed as "very small" and "very large" and those with such abnormalities as floppy ears and extra teats, and quite a large group under the heading "difficulty in learning to drink" and a smaller group showing "slowness in learning to eat".

Many of the abnormalities listed have not so far been shown to be transmitted in any hereditary pattern, and until this proof is obtained many of them must be regarded as the result of developmental, nutritional, or disease stresses. It must not be forgotten also that practically all the serious inherited defects of cattle are recessive characters, which means that before the condition shows, both parents must be carriers of the factor.

One of the important aspects of this survey was the finding that no bull had a large number of defective calves, the abnormalities being very well mixed among the bulls concerned.

I think that you will agree that the risks of getting abnormal calves from A.B. are very small, but this proportion could be raised if inbreeding was increased to any marked degree by A.B. This possibility will be considered under the heading of inbreeding.

3. A.B. upsets the sex ratio in calves.

All the complaints under this heading have so far concerned an excess of bull calves. Farmers often relate, with considerable feeling, their experiences with runs of bull calves from A.B. When these views are aired at farmers' meetings, a little investigation will nearly always bring forward another member at the meeting who has had a similar run of heifers.

The results of the survey taken out to get accurate information on this gave a sex ratio of 52 bulls to 48 heifers born in 100 births. This is exactly the same as the figure for natural mating. The apparent bias that occurs in individual herds is the result of the unpredictability of small samples. If it will be conceded that the sex ratio is 50 : 50 (for ease of calculation), the chances of obtaining varying numbers of bull calves in a herd of 50 cows would be as follows:

No bulls and 50 heifers, 1 chance in 1,000,000.000.000,000,000.

1 to 10 bull calves, 1 chance in 67,000
11 to 20 bulls, 1 chance in 10
21 to 30 bulls, even chances
31 to 40 bulls, 1 chance in 10
41 to 50 bulls, 1 chance in 67,000
All bulls and no heifers, 1 chance in 1,000,000,000,000,000,000.

It is perhaps small consolation to farmers with a bad run of bull calves in one season to know that there is very small chance of the experience being repeated the following year.

It was found that gestation periods for A.B. stock were the same as for naturally mated ones and that the twinning rate was also very similar. The survey quoted previously gave a twinning rate of 1 set of twins per 100 births, which is very close to the estimate given by Hancock* (0.6 to 1 per cent) in New Zealand, and for cattle in other countries according to Professor J. L. Lush, U.S.A. (0.8 to 1.8 per cent).

4. Use of A.B. lowers conception rates and results in delayed calvings.

It must be admitted that in some previous seasons conception rates in New Zealand were substantially below those from natural mating. These low rates were not in any way connected with the principle of A.B., because good results have been obtained since, but with the particular problems which confronted us in New Zealand.

For the past two seasons the conception rates in New Zealand have been good, and though not yet quite up to the accepted figures for natural mating, they are not more than 1 or 2 per cent behind. The average for the country in the 1956 mating season was 58.6 per cent and in 1957 59.7 per cent. These levels of settling are quite satisfactory, and in fact as the rate has improved over the past seasons there has been a noticeable tendency for farmers not to put back for A.B. service all the cows which return on the first round because they feel that they have enough cows in calf to cover their replacements. We do not consider that the level now attained is the maximum that will eventually be possible, and every effort will be made to improve the rate still further.

Though the present rates of conception from A.B. may be slightly below natural mating, it is worth while considering that the chance of a farmer having a completely blank sheet (as sometimes happens with a sterile bull

---

* J. J. Hancock, former Chief Animal Geneticist, Ruakura Animal Research Station.

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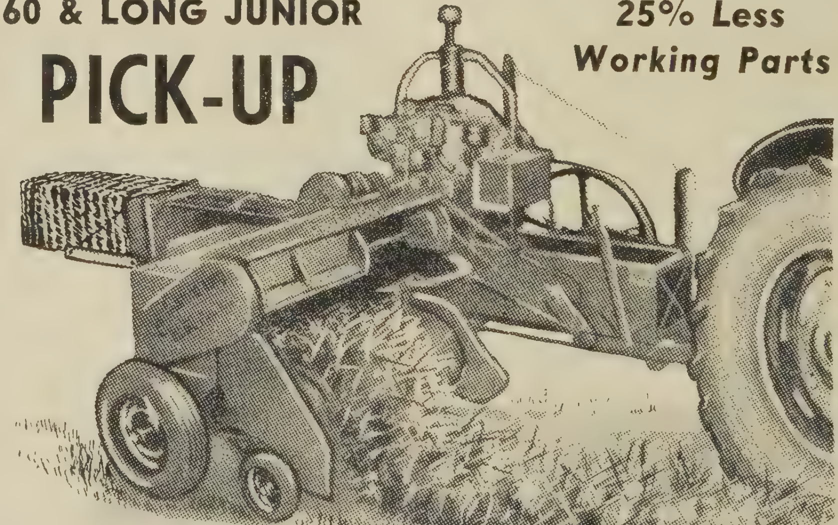

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or with one of very low fertility in natural mating) is practically nil in A.B., as his risks are spread over a large number of bulls and every sample used in the field is checked before dispatch. In addition the complete and accurate breeding records which are automatically kept for every farmer in the A.B. scheme protect his interests in a way few enjoyed before.

One more point which has a bearing on this matter is that there is a tendency for farmers to breed earlier with A.B. than they did with natural mating. This may be done as a cover against possible low conception rates, but it certainly depresses the conception rates slightly.

If the present settling rates can be maintained in the period of rapid expansion which is apparently not yet over, I am satisfied that no farmer will suffer on account of low conception rates or delayed calvings if his cows are healthy. It is interesting to note that there is each year an increasing request for A.B. service late in the season from farmers who have run into trouble with their bulls. We hope that in future we will be able to extend this service to any farmer who wishes to make use of it.

It is also significant that there is an increasing number of farmers who are not keeping a bull for use on their main herd, but are relying on an extended period of A.B. to settle all the cows which are fertile at the time.

5. Herds using A.B. are more subject to disease than those naturally mated.

Emphasis has been given at every opportunity on the measures which are being carried out to protect farmers against the possible spread of bovine venereal disease through A.B. It is disappointing to learn of innuendoes, and on odd occasions outright statements, that venereal disease is on the increase where A.B. is practised. Though in the past we have been confident that the health test applied to bulls entering the bull stud was effective, and the best that was practicable under our conditions, there is growing evidence to show how successful the measures have been.

Out of more than 69,000 calvings to artificial matings the abortion rate was 2.2 per cent. A comparable figure for naturally mated herds was 2.8 per cent. Both percentages are based on calvings of cows 3 years old and older. Again, no bull could be selected as having more than his share of aborting females.

Figures are also available for the number of late returns to service. These show that fewer A.B. cows return from the end of the A.B. service to calving than naturally mated ones. Again, no bull showed an abnormally high percentage of late returns.

How many farmers when buying bulls subject them to the number of tests that all A.B. bulls (including yearlings) must pass before they are approved for A.B. use? Bulls at the Newstead bull centre also run considerably less risk of acquiring infection, because all collecting apparatus used is reserved for one animal and there are no untested females on the property for accidental cross-infections. These measures, with the addition of antibiotics to all extended semen issued, give a very large measure of protection and result in considerably less risk to the A.B. user than the farmer using natural breeding.

We have not yet received any reports which on investigation suggest that any bovine venereal disease has been spread directly from the bulls at the bull centre, but, so that the facts can be examined, we would welcome any information which indicates that this may be suspected.

Some farmers may be concerned with the possibility of the spread of disease from farm to farm by the visiting technicians. The routine followed in this country is identical with that practised overseas, and I have not heard of any case of disease transmitted from herd to herd if the routine methods laid down are strictly followed. Special precautions are set out for technicians handling herds under suspicion for presence of disease and only in cases of gross negligence should trouble occur.

The standard of work of field technicians has been very high and results from large numbers have been remarkably even. It would be senseless to pretend that there are not some disappointments, but they can be readily located, and the cure is simple. If there are any queries on the subject of disease incidence in herds, either during the active artificial breeding season or afterward, they should be made at once to your veterinary surgeon so that the matter can be looked into immediately.

6. Use of A.B. will increase the danger of inbreeding.

As inbreeding is liable to affect production, viability, and fertility adversely and at the same time produce more defective cattle than outcrossing, there seems to be little reason for adopting it in commercial herds, apart from deliberate attempts to uncover recessive traits. The users of artificial breeding may therefore be concerned about the extent to which inbreeding may take place in their herds unless some steps are taken to counter the chances.

The proving of young bulls within the organisation will tend to increase the chances of inbreeding, compared with the situation where all bulls used are selected from breeders outside. At present most of the bulls are bred outside the A.B. organisation, but in future a greater and increasing proportion will be bred within it.

Taking the figures as they would be in 1962, if present trends are maintained, it has been calculated by Miss O. Castle of the Herd Improvement Department of the New Zealand Dairy Board that the chances of getting heifers in milk from a sire-daughter mating would be 1 in 3,800 and for a half brother-half sister mating 1 in 1,130.

These are fairly long odds, and the average dairyman may be prepared to take them. However, by the time this situation arises (1962) a second bull centre will possibly be taking shape, and with an exchange of bulls between centres (or even the zoning of young bulls), the risks of even this degree of inbreeding could be substantially reduced. Another effective measure to avoid inbreeding would be for farmers to note beside their A.B. stock on the shed sheet the code number of their sire so that the inseminating technician could use another bull on these animals.

7. Use of merit sires of the standard laid down for A.B. will result in every farmer having 400 lb. butterfat cows.

This is certainly a very rare misconception these days, but the question does still crop up. In the early years of this work the minimum standard set for bulls used for A.B. was that the daughters must average 400 lb. of fat on a maturity basis. Occasionally farmers still express disappointment that theirs fall short of this standard. The level of production in any herd depends on a number of things, the most important being feeding, management, and breeding. Herds on low production levels are probably being restricted more by poor feeding and management than by breeding; at higher levels breeding is the more important.

If a herd average (of mature cows) is 250 lb. of fat, the average bull in the industry used on that class of herd will leave daughters producing 258 lb. of fat. As the average lift for all the merit bulls used at the bull centre is 18 lb., the total lift using the merit bulls at the bull centre on such a herd would be 26 lb., which is 18 lb. more than the average bull would do. Thus the mature cow average should be 250 lb. plus 26 lb. or 276 lb. when all animals are by the merit bulls. The average lift for all unproven bulls at present is 6 lb., so in similar manner the total lift using these animals would be 14 lb.

At the other end of the scale the average bull used on a herd averaging 400 lb. would leave daughters averaging 365 lb. Hence the merit bull at the centre would raise those by 18 lb., bringing the average to 383 lb.

8. The present level of A.B. service both in respect of bull quality and proportion of merit to son-of-merit semen used can be maintained without extended herd testing.

The present position is this: 30 per cent of all farmers who herd test are in the A.B. scheme, and less than 40 per cent of the A.B. users herd test. During the next few years if A.B. expands at the rate it has done in other countries, and present indications are that it will, by 1962, 500,000 cows will be offered for A.B. service. This will require 106 able-bodied merit bulls and a yearly intake of nearly 140 yearlings. With 30 per cent of testing members already using the A.B. service and probably many more joining by this time, the past source of most of our merit bulls is going to be considerably reduced. To safeguard future requirements of merit bulls increasing numbers of yearlings will have to be surveyed each year. In the past 10 were used, then 20 were thought necessary, this year 40 have been bought, and so on until by 1962, 137 will, it is estimated, be needed to ensure that enough bulls qualify as merit sires to maintain that service at the 70 per cent ratio of merit to son-of-merit of past years.

Average stock losses and the fact that 50 per cent of all successful matings are bull calves, together with the fact that only 40 per cent of A.B. users are testing, all combine to make it necessary to mate 1,000 cows to each yearling to get 50 heifers identified, milked, and tested. Fifty tested daughters is the minimum number acceptable for an accurate survey of the young bulls.

In the past the use of unproved bulls has not been as extensive as desired, though a better than 70 per cent service to merit bulls has always been provided. During the past 2 seasons a special effort has been made to get these bulls used as widely as possible by marking each lot of semen in a special way so that field technicians could use it up before starting on the material from 2-, 3-, and 4-year-olds that they happened to be carrying.

Figures from the season just passed show that a very high proportion of the semen issued to technicians was actually used—in the Waikato 3,300 inseminations out of 4,000 doses issued. It was shown in the survey of calvings in A.B. cows mentioned earlier that the percentage of heifers from unproved bulls reared by farmers was much higher than expected; in fact 79 per cent of heifers from the unproved bulls were reared for 82 per cent from the merit bulls. What is vital is to get information about the productions from these heifers from unproved bulls if the future requirements of merit sires are to be met.

An encouragement to test these heifers has been offered in the past 2 seasons by the payment of 25s. for each heifer of a yearling bull tested in the breeder's own herd, this token payment covering the cost of getting the dam inseminated. The response to this offer has been very limited; in the past year not more than 200 claims have been made for the whole of New Zealand.

To encourage further the testing of the daughters from these yearling bulls a payment of £5 is now being offered for the testing of identified heifers (during their first lactation) in the breeder's or purchaser's herd, either on monthly or alternate monthly testing. Lists of bulls whose daughters qualify for this payment will be issued before each calving season, and bulls whose heifers will qualify for a bonus payment in future will be marked in each bull catalogue. We are hopeful that these conditions will encourage farmers to support the herd testing movement, as the bonus on 10 per cent of such heifers in a tested herd will go a long way to paying the testing fees for the whole herd. By supporting this scheme present users of artificial breeding will be insuring themselves against a possible future lowering of production standards and will be helping to maintain the present very satisfactory proportion of merit sire coverage.

Fears Quite Unfounded

To summarise, therefore, I consider that fears for the deterioration of the quality of our dairy cattle, either now or in the future, as a result of A.B. are quite unfounded, because comparisons fail to show any character in which A.B. cattle are inferior to those naturally bred; in fact considerable advantage on production accrues from its use.

The dangers of inbreeding are also grossly exaggerated and remedies are available should the future situation demand it. There is considerably less risk of introducing bovine venereal diseases in a dairy herd with the use of A.B. than through natural mating, and conception rates are so very little below the figures for natural mating that no harmful effect need be feared on settling rates during the breeding season or in calving patterns the following year.

To maintain the present high standard of production demanded in an A.B. bull's progeny, users of the service must test unproved bulls to maintain the supply of merit bulls in a rapidly expanding organisation. A very attractive inducement to join the herd testing movement is now being offered.

* * *

Meteorological Records for September

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	54.3	+ 0.5	69.0	36.1	7.53	25	+ 2.39	1.44	8	126
Auckland	160	55.1	+ 0.6	67.4	40.1	3.16	15	— 0.63	1.31	9	200
Tauranga	8	51.8	— 0.8	66.0	35.3	3.23	13	— 0.99	1.15	13	210
Ruakura	131	50.6	— 0.3	68.7	28.7	2.14	11	— 1.54	1.13	13	183
Whakarewarewa ..	1006	48.8	— 0.2	65.3	30.9	2.35	10	— 2.39	1.60	13	192
Gisborne	14	50.6	— 1.5	69.4	31.8	2.46	18	— 0.16	0.55	9	160
New Plymouth ..	160	52.4	+ 0.7	66.8	38.8	0.81	5	— 4.09	0.41	13	208
Karioi	2125	43.9	— 1.1	63.9	25.0	0.84	6	— 3.43	0.21	1	
Napier	5	50.5	— 1.5	70.9	34.2	1.16	9	— 0.81	0.54	10	198
Wanganui	72	50.9	— 1.2	70.0	34.2	0.46	3	— 2.08	0.19	13	224
Palmerston North ..	110	50.8	+ 0.3	69.5	30.0	0.50	6	— 2.51	0.26	1	223
Waingawa	340	47.6	— 1.7	67.0	28.0	1.11	13	— 2.16	0.44	13	213
Wellington	415	50.6	+ 0.7	64.9	36.9	1.91	4	— 1.93	1.38	13	243
Nelson airfield ..	5	47.4	— 0.8	67.2	31.3	2.10	9	— 1.06	1.89	13	252
Blenheim	12	50.0	— 0.2	68.7	29.0	0.83	2	— 1.45	0.76	13	242
Hokitika	15	47.6	— 0.2	62.6	30.9	5.50	12	— 3.12	2.09	13	209
Hanmer	1270	45.5	— 0.6	69.0	24.0	1.72	5	— 2.71	1.19	13	215
Christchurch ..	22	48.2	— 0.5	70.9	27.2	0.36	3	— 1.70	0.23	23	208
Ashburton	323	48.2	+ 0.3	72.8	24.6	0.09	3	— 2.53	0.04	13, 23	230
Timaru	56	46.4	— 1.5	67.1	27.5	0.12	2	— 1.83	0.11	23	202
Alexandra	520	47.0	— 0.1	70.2	22.1	0.10	3	— 0.72	0.04	24, 29	201
Taieri	80	46.2	— 1.5	72.3	25.1	0.16	5	— 1.77	0.05	23	187
Invercargill airfield ..	0	47.6	+ 1.9	67.6	29.0	2.67	10	— 0.55	1.67	29	163
Chatham Islands ..	140	46.6	— 1.6	57.4	34.0	1.12	14	— 1.33	0.68	14	

The Home Garden in December

By A. G. KENNELLY,
Horticultural Instructor, Department of Agriculture, Dunedin

THOUGH there are plenty of vegetables in most home gardens in December and the greater part of the main-crop planting and seed sowing is completed, vegetables for winter use should not be overlooked. In most districts plants such as winter cabbage, broccoli, brussels sprouts, kale, and leeks should be set out late in December or in January for late autumn and winter use.

TALL crops such as runner beans are best staked. Most varieties of tomatoes require pruning, staking, and tying and, except in some southern districts, spraying with DDT against caterpillars and with bordeaux mixture or suitable Government-certified substitute against fungous disease.

Celery should be sprayed with captan or bordeaux mixture or a suitable substitute even before leaf spot disease appears. In the more humid districts potatoes should be sprayed with bordeaux mixture or copper oxychloride or suitable Government-certified substitute. Potato tubers should be kept well covered by moulding the soil to as sharp a ridge as possible.

Liquid manure can be applied with advantage to most crops in ground lacking plant food and where necessary watered. A supply of water is particularly important to the growth and setting of beans, to the growth of lettuce and celery, and to only a slightly less extent to that of other greens.

Weed killing is still necessary, even among established crops, as weeds not only deprive crop plants of food and moisture, but are often the means by which insect pests and diseases are carried over from season to season. Hoeing is usually the most effective way of controlling weeds among home garden crops.

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Dwarf beans, beetroot, carrots, celeriac, kohl rabi (where ground is not likely to dry out), lettuces, mustard greens, New Zealand spinach, radishes, spring onions, turnips.

Other Sowings

Parsnip, if seed has not yet been sown; now getting late in southern districts. Swedes; sowing can be deferred in warm districts. Peas, where soil does not dry out.

Winter Greens to Be Set out

Broccoli or winter cauliflower and savoy cabbage (several varieties of each to ensure succession), brussels sprouts, kale or borecole, leeks.

Other Seedlings to Be Set out as Required

Celery (self-blanching and the ordinary green or white), celeriac, tomatoes (where plants have not yet been set out and in favourable situations only), lettuce (where conditions are not too hot and dry for transplanting), summer cabbage, cauliflower.

Potatoes

Small planting can be made, where ground is likely to remain moist enough for good growth, to provide new potatoes in late autumn or early winter.

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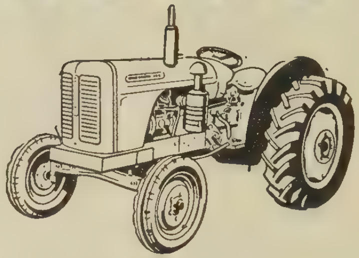

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NEW ZEALAND RAILWAYS

Kumara runners should be lifted periodically to prevent them from rooting. If they are lifted regularly, the vines will not mat together and are much easier to turn. Kumaras are grown commercially only in the northern parts of New Zealand, but in some seasons they will succeed in warm, sheltered areas as far south as Christchurch.

Where broad beans are attacked by the fungous disease known as rust they should be sprayed with zineb regularly. Rust is recognised by the rusty pustules which develop and should not be confused with chocolate spot, a fungous disease which causes chocolate-coloured blotches on the leaves. Chocolate spot can usually be controlled by thiram or copper sprays.

Carrots

Small successional sowings of carrots can be continued or the main crop can be put in now. Carrots are a useful vegetable for winter, and where there is sufficient moisture in the ground December sowing is satisfactory. Dry conditions check growth, and affected young plants succumb quickly if aphids attack them. December or January sowings of intermediate or stump-rooted kinds usually result in the production of good-quality roots in late autumn, whereas roots from earlier sowings have by that time usually become large and may be rather coarse.

A close watch should be kept for aphids. Carrot aphids are small, globular, and green or yellowish-green and may be wingless or have four transparent wings. They suck the sap and stunt growth, so that young plants may wilt in hot weather. The foliage may change to a bronze, bluish, or reddish hue and become distorted. The tiny white specks present are the cast skins of the aphids. Aphids can be controlled by spraying with nicotine sulphate or lindane.

The carrot rust fly is also troublesome in some districts in December. The adult fly is about ⅓ in. long. It has a yellowish head, yellow legs, one pair of wings, and lays its eggs near the crown of the carrot. The larvae or maggots are slender, creamy white, rather rigid, legless, and up to ¼ in. long; they are broad at one end and taper off to a slender head.

After hatching the larvae burrow down and attack the taproot, leaving rusty brown tunnels which at first are only near the surface of the carrot. Young carrots may wilt or die.

Control consists mainly of treating the seed with lindane or dieldrin and if necessary regular spraying with either of these substances. Spraying any nearby hedges with DDT to kill the flies is of some value.

Celery

Where conditions are warm enough celery can be set out during December in beds or trenches in soil that has been heavily manured. Beds for self-blanching celery are usually made 4 to 6 rows wide with the plants set out 10 to 12 in. apart each way. In trenches a double row 9 to 12 in. apart with the same spacing between the plants is satisfactory. The trench can be any depth up to 12 in.

Weeds are readily destroyed with the hoe when they are small if the soil is dry.

[*Green and Hahn*

Seedlings should be thinned while they are small.

Blanching of double rows can be done by drawing the soil high against the ribs, care being taken not to allow any to get into the centres of the plants, or by wrapping individual plants with stout paper. Beds containing multiple rows are best blanched by placing a length of 12 in. x 1 in. timber along the outside edges of the bed. Blanching should not be begun until the plants are about 3 weeks from maturity, as otherwise their development will be arrested.

Poultry or farmyard manure is a very suitable manure, but where this is unobtainable or in short supply a mixture of 4 parts of blood and bone, 2 parts of superphosphate, and 1 part of potash by weight can be broadcast over the area at ¼ lb. to a square yard and worked into the soil after digging.

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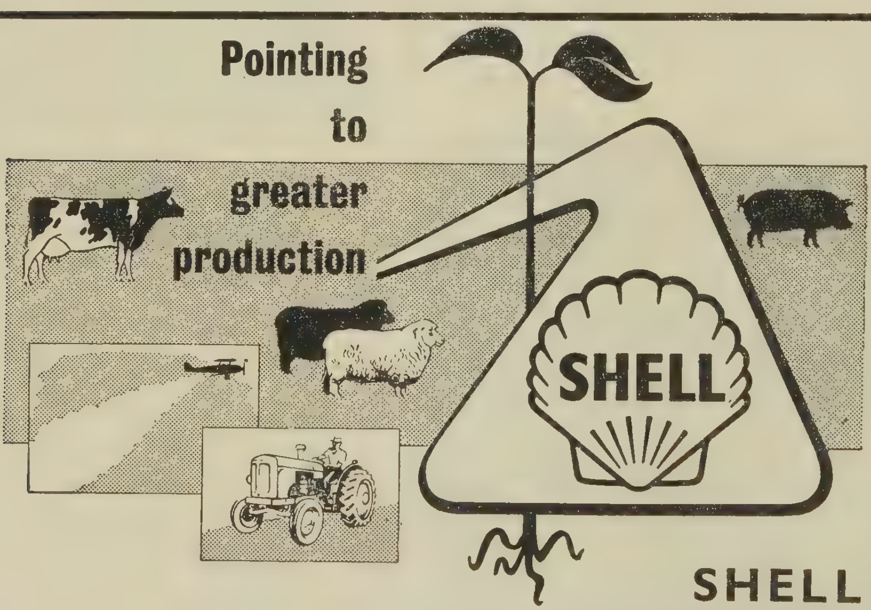

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[Green and Hahn

Celery can be set out in December.

Celery should be kept weed free. Where conditions are humid enough for leaf spot to be troublesome it should be sprayed with a suitable Government-certified fungicide at 10- to 14-day intervals. If aphids are present, nicotine sulphate (1 fl. oz. to 5 gallons of water) should be applied. Celery should not be planted in a part of the garden recently occupied by a carrot crop which has been affected by the carrot rust fly, as the pest is also liable to attack celery.

Lettuces

Lettuces cannot be grown successfully in dry conditions. If the soil is aerated, well drained and cultivated, and rich in humus, the crop responds well to irrigation or watering, provided the soil does not set hard afterward. Crisp, sweet, and tender heads can be produced only by quick growth, which may usually be induced in poorly manured soil by organic liquid manure or by liquid manure made from nitrate of soda or sulphate of ammonia at 1 to 2 oz. to 4 gallons of water.

In the hotter or drier districts at this time of year it is preferable to sow the seeds thinly (¼ in. deep in rows 12 in. apart) and later to thin the plants to 9 in. apart in the rows rather than to transplant them. The rows should be watered after thinning to settle the soil back round the plants that are left, as otherwise they may receive a check which may later result in premature seed development.

Varieties are available to suit various climatic conditions in New Zealand. In the warmer districts varieties such as Great Lakes, Imperial 847, or New York 515 (Webbs Wonderful) are especially suitable.

Winter Vegetables

Brussels sprouts, kale (borecole), savoy cabbage, and broccoli (heading and sprouting) deserve more attention than they receive in most home gardens. They are high yielding and after establishment require comparatively little attention. The soil should be enriched some time before planting by the thorough incorporation of well rotted organic manure. Fairly heavy loams that are well drained and suitably enriched are usually preferable.

Though plants are not difficult to raise from seed, most prefer to buy them. They are available from seedsmen for setting out in December, January, or early February.

If cabbage aphids, diamond-backed moth, and white butterfly are troublesome, the foliage or the plants before being set out should be dipped in a solution of lindane or of nicotine sulphate plus DDT. Where aphids are not troublesome only DDT or lindane need be used.

Brussels Sprouts

Brussels sprouts have a well deserved popularity and are not difficult to grow. The main needs are a deeply cultivated, rich, firm soil, adequate moisture, good spacing, a long season of growth, and, where grey aphids are troublesome, regular and thorough spraying with nicotine sulphate or lindane.

In New Zealand varieties are rarely classified, but overseas they are usually listed according to height and occasionally to maturity. Good types of brussels sprouts should form sprouts early and uniformly and sprouts should last well without bursting. They should be set closely, but not so close that picking is difficult, and should be firm, large, round, compact, and a healthy green. Plants should also be resistant to adverse weather and aphids (some varieties are more resistant to aphids than others).

Brussels sprouts succeed on a wide range of soils, but if grown on land too rich in nitrogenous material, they usually grow rankly and produce many loose, open, poor sprouts. Soil richly manured with organic material for a previous crop is best, and for the growth of the sprouts it can be dressed with artificial manure, as too much organic matter may tend to make the soil spongy, and firmness is required for good sprouts. A complete fertiliser (one containing nitrogen, phosphorus, and potash) usually gives the best results, though the dressing in many New Zealand soils should be highest in phosphoric acid, which can be supplied by applying superphosphate.

In home gardens where space permits and brussels sprouts are appreciated several crops can be grown each year. A first sowing made under glass in August can be followed by one or more successional sowings,

HARVESTING OF RHUBARB AND ASPARAGUS

HARVESTING of main-crop rhubarb should be discontinued during December if it has been heavy during spring, and the bed cultivated and manured. Rhubarb in rich, well manured soil that is moist throughout the year can be harvested in moderation while growth remains vigorous.

Harvesting of asparagus should cease in most districts by the beginning of December to enable plants to develop foliage and to build up reserves.

the last usually in November, provided that in southern districts there is a sufficient period for the plants to develop fully before winter.

Varieties

Varieties include Scrymger's Giant, Long Island Improved, and Cambridge varieties.

Broccoli

The common broccoli is for all practical purposes a hardy winter cauliflower and does not differ from the cauliflower usually grown for summer use except in hardiness and stronger development (in most varieties) of the leaves encircling the head. Varieties are available which mature in from about 5 to 12 months. Transplanting is usually done in December or January, but in districts having a long, mild autumn or where the soil is moist and there is reasonable freedom from severe frosts some varieties can be set out in February.

Except for weed control and, where weather is boisterous, a certain amount of earthing up of the stems to stabilise the plants, broccoli planted in rich, well drained and well cultivated soil require little attention. As the curd begins to develop a leaf or two should be bent over it to give protection from frost.

Modern strains of broccoli produced by reputable seed firms are on the whole fairly reliable and start to head in according to their specified maturity periods, but unseasonable weather, particularly if sunny or moist and warm, is always liable to alter the timetable. Varieties should be chosen to mature successionally to provide supplies over as long a period as desired.

Non-heading Varieties

There are green, white, and purple kinds of non-heading, sprouting, or Italian broccoli. They produce a terminal main head on a fleshy branching stalk. After the main head has been removed side heads or shoots continue to form on most varieties and may be picked for a considerable period. Varieties of sprouting broccoli vary in time to reach maturity from about 3½ to 12 months. The quick-maturing varieties are treated like cabbage and the slow-maturing ones usually like broccoli. Heights vary from 15 in. to about 36 in.

Varieties

Varieties include Italian Green Sprouting (Calabrese), Early Purple Sprouting, Late Purple Sprouting, and White Sprouting.

Kale or Borecole

There are several varieties of kale, but Scotch kale or borecole is most commonly grown in home gardens. The kales are very hardy and cultivation of most varieties is similar to that of brussels sprouts. They deserve to be more widely grown in New Zealand gardens, because good strains are among the most delicious and health giving of vegetables.

Unfortunately the growing of strong-flavoured, coarse-leaved kinds has been responsible for much prejudice against kale. Home gardeners should endeavour to select reliable seed of a suitable variety. The best tender fine-curled strains and Scotch kale of British origin are among the most useful hardy vegetables in the home garden.

Kale matures according to variety and conditions in from 2 to 5 months and is grown mainly as a winter vegetable. Generally the common varieties fall into two groups: Dwarf, about 12 to 24 in. high, and tall, about 30 in. or higher.

Plants should be set out 18 to 24 in. apart (according to height) in rows 30 in. apart.

Leeks

Though leeks can be set out earlier and, in districts where autumn is sufficiently long, later than December and January, these are the preferred months for planting. A good plan is to have two or more plantings. In most districts an early, a mid-season, and a late planting will ensure a supply of leeks from autumn until late spring.

Leeks are a great standby and are very easily grown. They are rarely affected by insect pests or disease, and though cabbage and cauliflower (or broccoli) mature according to their season and are available or in best condition only then, leeks will stand for many months and may be used as required.

Plants can be set out 6 to 8 in. apart in rows 12 in. apart. A trench 3 to 4 in. deep can be drawn out with a hoe and holes made with a dibble somewhat deeper than the white portion of the plants to be set out so that the plants can be dropped in the holes and left with portion of the green tops (the ends of which should be cut off) protruding. If the plants are then watered, it is not necessary to fill the holes. The soil will gradually erode and fill them. Where the soil is heavy and sticky, the holes should be made with a trowel, as a dibble will consolidate it excessively.

Soil for leeks should be rich, preferably in organic manure, but where the water-table is sufficiently high excellent crops can be grown with artificial fertilisers alone. A complete fertiliser (one containing nitrogen, phosphoric acid, and potash) should be applied and thoroughly incorporated throughout the bed at 3 to 4 oz. per square yard.

Varieties

Varieties include London or Broad Flag, which is best grown for early use; Musselburgh, which is a very hardy variety usually characterised by its long, blanched stem; and Lyon, which is generally similar to London but grows larger and is slower maturing. Lyon is a good variety for a late crop, as it is slow in running to seed.

◆

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during August 1958 with comparative figures for the same month of 1957 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER

Month	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc.
August 1958	11,446	106	11,552	—
August 1957	11,191	110	11,301	—
Increase or decrease	+255	—4	+251	+2.221

Butter in store at 31 August 1958 was 7,761 tons

CHEESE

Month	White (tons)	Coloured (tons)	Total (tons)	Percentage dec.
August 1958	1,420	37	1,457	—
August 1957	1,618	40	1,658	—
Decrease	—198	—3	—201	—12.123

Cheese in store at 31 August 1958 was 7,608 tons

If these figures are converted into butterfat equivalent, there is an increase of 1.331 per cent in butterfat graded for August as compared with the same month of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place they are not necessarily a true indication of production trends.

Recommended Techniques for
HILL COUNTRY FARMER

SOME tested principles of integrated stock and pasture management which can be expected to lead to rapid and economically sound development of hill country farms were given by E. A. Clarke, Senior Principal Research Officer, Department of Agriculture's Animal Research Station, Ruakura, in a paper at the 1958 Farmers' Conference Week. A hypothetical farm of 1,000 acres on easy to steep hill country in Auckland Province was used by Mr Clarke as a basis for the application of valuable results of research at the Ruakura Hill Country Station, where he is in charge.

FOUR years ago Dr C. P. McMeekan, Superintendent of the Station, addressed the Ruakura Conference on modern techniques in fat lamb farming or "how he would run a fat lamb farm". In introducing his subject he expressed a certain amount of diffidence mainly on the grounds that documented evidence on many facets of his subject was lacking and consequently certain recommendations would be based on experience rather than experimentation.

I am very conscious of an even greater paucity of factual information relating to hill farming. Furthermore, hill country farming practice is subject to much wider variation than fat lamb farming because of extreme contrasts in such things as soil type, climate, contour, elevation, and aspect even in relatively adjacent farms. Also the products of hill country farming tend to be more varied and adjacency of good markets for particular products will often be reflected in farm policy.

HEADING PHOTOGRAPH: Research at the Whatawhata Hill Country Station, part of which is shown above, is the basis for the techniques recommended in this paper by Mr Clarke, who is in charge at the Station. The Station is typical of much hill country in the North Island.

Good prices for farm products over the past decade have resulted in such practices as aerial topdressing, oversowing, and subdivision changing much of our hill country out of all recognition. In many cases what was store country is now breeding country and some even fattening country. Nevertheless, a basic problem is still that of combining more or less in the animals a dual role. They are the units of production; they are also the implements, often the only implements, of pasture management and second growth eradication and control.

For such reasons I do not propose to do as Dr McMeekan did and give a clear-cut farm and stock management policy, nor am I able to lay down an immediate production target in terms of meat and wool per acre. My aim is to highlight some techniques of stock and pasture management which will, I believe, contribute best to the overall aim of maximum production per acre consistent with efficient pasture and second growth control.

Hypothetical Farm

To simplify my task I will roughly describe a hypothetical farm to which my remarks would be applicable. This farm of 1,000 acres is situated on easy to steep hill country in the Auckland Province.

The rainfall is about 50 in. per annum with a dry spell usually in January or February in most years and sometimes extending more or less over both months. The elevation ranges from 100 to 1,000 ft. and soil types are mixed, but in the main are derived from greywacke with some ash shower on the easier portions.

There are about 100 acres which could be negotiated by a crawler tractor and implements, and small areas suitable but difficult for haymaking.

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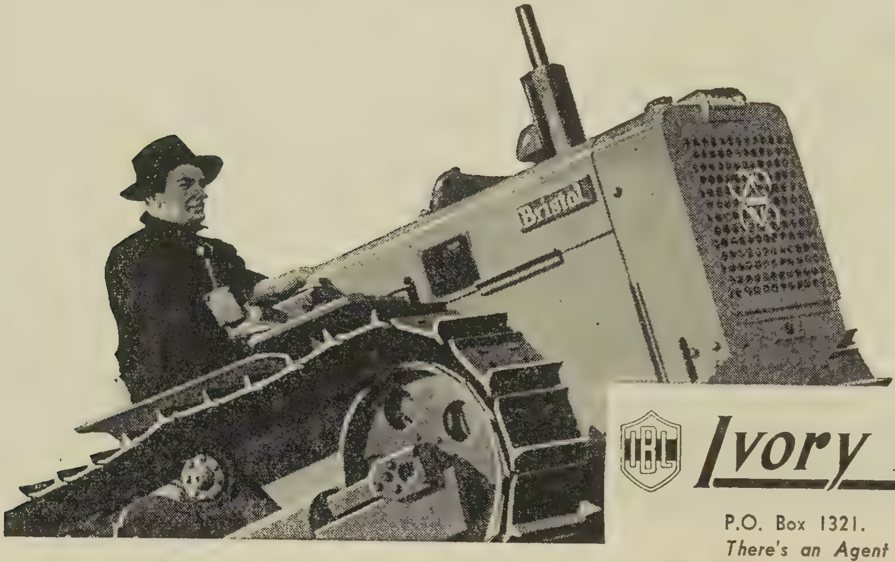

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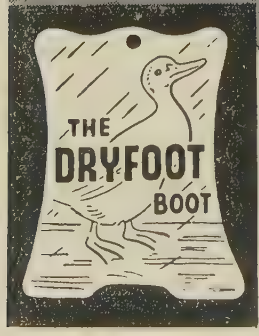

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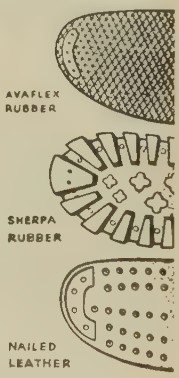

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About 100 acres is made up of very rough fern faces, scrub, and scattered bush, and bracken and hard fern (ring fern or carpet fern) are still the major problems on at least 400 to 500 acres. Scattered gorse and blackberry are in evidence still, and ragwort and bidi-bidi have not been entirely eliminated.

The buildings, yards, dip, etc., are average and reasonably efficient. The hay barn of 1,800 bales capacity might be thought a luxury by some, though I regard it as an essential.

Topdressing with serpentine superphosphate at 2 cwt. per acre has been regularly carried out over the past 5 years and small areas treated with molybdenised superphosphate have clearly demonstrated the benefit to be expected from its use on the greywacke-derived soils.

The labour force is made up of the owner and an experienced farm hand with a suitable team of dogs. Contract work on fencing, scrub cutting, and cultivation is employed as necessary. A small crawler tractor is available for light cultivation work, the initial breaking of ground being done by a contractor. About 10 to 12 acres are cultivated each year for swedes, followed by chou moellier the following season, and are then spring sown to grass in September.

Carrying capacity is steadily increasing and at present is made up of:

1,200 mixed age Romney ewes
450 ewe hoggets
30 mixed age Romney rams
180 Polled Angus cattle, including 60 breeding cows plus replacements
2 Polled Angus bulls.

This rate of stocking has been achieved as the result of topdressing, oversowing scrub and fern burns with clovers, ryegrass, cocksfoot, and crested dogstail, and by subdivision into some 20 paddocks, ranging from 20 to 80 acres. Further subdivision is contemplated only where ridges lend themselves to easy fencing or where it is reasonably easy to separate sunny and shady faces so that fern control on the latter is simplified. Water supplies do not impose a serious limitation on subdivision.

In stocking of this farm the maximum number of ewes is the aim, since these are the most productive stock. Cattle numbers are about static while ewe numbers are increasing, but cow numbers are still increasing at the expense of dry stock, because again the cow is the more profitable and can play an increasingly important part in pasture and weed control as the country improves.

The maximum number of breeding stock and the minimum of dry stock means the fewer mouths to winter and the maximum mouths to utilise and control the spring flush of feed and to control the summer fern regeneration. The grazing of stock to achieve this follows, for as much of the year as possible, a mob grazing system with most of the stock, preferential treatment being given to the young stock and to the breeding stock before parturition and during lactation.

Ewe Management

To achieve high production per acre on this country, as on fat lamb country, necessitates high ewe carrying capacity. Production per ewe is less important than production per acre.

Trials on the Hill Station contrasting a flock well managed throughout the year and always well fed with a genetically identical flock farmed under a system of chronic overstocking at all times reveal that the overstocking system decreases production on a ewe basis by about 15 per cent in wool production, by 3 to 10 per cent in lambing percentage, and by about 10 to 12 per cent in lamb weaning weight.

Our data do not yet permit accurate conversion of these differences to a per acre basis, but a conservative estimate of relative stocking rates under the two systems would be at least 3 for the overstocking system to about 2 for the other. There can be no doubt which system yields the greatest return per acre. One would not, however, advocate an extreme overstocking system which leaves one at the mercy of unfavourable seasons, when it becomes necessary to sell breeding stock in poor condition on an unfavourable market. It is clear, however, that in the interests of maximum production per acre the aim should be to err in the direction of overstocking rather than understocking. Maximum carrying capacity per acre is also in the best interests of full pasture utilisation and pasture and weed control during periods of rapid growth.

The aim, however, would be to go into the summer dry spell with a good leafy cover on well controlled pastures. This greatly reduces the impact of the dry spell on pasture production. As the sward improves under topdressing and controlled grazing, with better species replacing danthonia, browntop, and weeds, the normal dry spell ceases to be a hazard, but is more regarded as an opportunity to catch up on pasture control on the less developed areas. Early weaning, as will be shown later, contributes greatly to these objectives.

Preparations for tupping begin about 3 weeks before the rams are turned out. The 2-tooth ewes are kept separate from the older ewes, and these two flocks are mob grazed as before, but complete utilisation of feed is not now aimed at, since a liveweight increase in the ewes is the objective. This in the older ewes is to achieve flushing, but on hill country, and particularly in a dry season, a live weight gain of up to 15 lb., which is the objective recommended by Dr L. R. Wallace, at Ruakura, is not so easy to achieve. With the 2-tooth ewes easier grazing aims at continuing their steady development, which has been the objective since weaning In both flocks good body weight at tupping is desirable, since Dr Wallace has shown that this is probably conducive to better lambing percentage.

The rams are put out about 20 March, since before this on this country few ewes commence their breeding season. It has been shown by Mr Inkster that the 2-tooth ewe has a weak heat and one of short duration and does not seek the ram as does the older ewe. The 2-tooth ewes will be grazed through the smaller paddocks and the handiest paddocks so that they can be mustered daily to facilitate the work of the rams. With the 400 ewes in this flock 12 rams will be used and these will be 4-tooth and older since the 2-tooth ram, though vigorous, shows a degree of inexperience in his work. The older ewes, numbering 800, will have 18 rams and apart from the infrequent shifting under mob grazing will not need mustering.

It will be noted that all the rams have been turned out. This is because the majority of ewes, up to 80 per cent, are mated in the first month. The rams will be removed after 10 weeks, since our experience is that prolonging the mating season beyond this period results in only a small increase in lambing (about 1 per cent) and the few extra late lambs are a complication in the grazing management policy.

Flushing is continued for 2 to 3 weeks into the tupping period and then the grazing management is tightened. With the rams removed the mobs are combined, since a well reared 2-tooth winters as well as a mature ewe.

From the end of April onward grazing management aims at spelling as many paddocks as possible to provide early spring feed. To achieve a worthwhile result the ewes must be done hard on the rougher paddocks, the better ones being left to grow pre-lambing and lambing feed. My aim is to conserve feed on at least one-third of the farm.

A maintenance or slightly sub-maintenance level of nutrition for the ewes from mid April until the 3 to 4 weeks before lambing commences will not do harm, but from this time onward a rising plane of nutrition is desirable and a safe precaution against sleepy sickness.

About 3 weeks before lambing is due to commence, in this case the end of July, the ewes are divided into early and late lambing mobs and these are now set stocked, the former on the best of the saved paddocks and the latter spread more thinly over the

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An article, featuring this headline, appeared in the September issue of the "Journal of Agriculture". Outlining the experiences of a dairy farmer using modern irrigation methods in the Tauranga district, it gave positive proof of how he has been able to step up production, increase his income, and improve the value of his farm.

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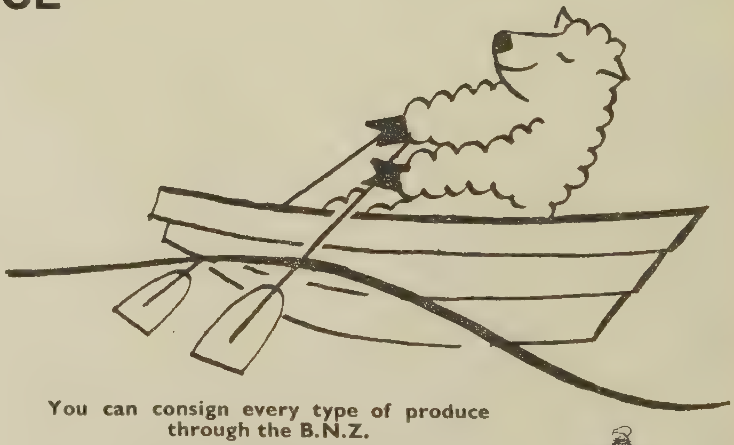

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poorer paddocks. Set stocking would be practised until weaning, though it may be necessary to move a mob or part of a mob if the initial set stocking has been at fault.

The division of the flock into early and late lambing groups has several objectives. Firstly, it ensures that most of the ewes which are near lambing get the spelled feed. Secondly, it concentrates the work of shepherding and finally it facilitates docking and ensures that all dry ewes are in the late lambing paddocks.

As my country cleans up and subdivision is completed and allows easier access from paddock to paddock the "shedding system" of ewe management during lambing, as used by Dr McMeekan on his fat lamb farm, would be adapted and modified to suit the much more extensive conditions of hill country. Its advantages are obvious and ewes accustomed to mob grazing lend themselves readily to this form of management. They automatically head for the gate at the bark of a dog.

The measures to reduce losses at lambing time which would be adopted are those which are dealt with in an article in the September issue. Ewes with bearing trouble would be immediately tagged with a red plastic ear tag for easy recognition at culling after weaning. Treatment would consist of replacing the bearing and keeping it in place before lambing with a retainer or after lambing with a stitch of cotton tape. Cleanliness and the use of penicillin will save most of these ewes. Though our work indicates that the disease has little if any hereditary background, subsequent breeding performance is so poor and recurrence of the disease so frequent that ewes with it should be culled. Where possible such ewes should be drafted from the flock so that they may be watched more carefully and grazing management should be hard.

During lambing and at docking red tags would be used on all culls observed and in addition at docking dry ewes would be tagged with a blue tag. Next year any dry again would have the blue tag replaced by a red to indicate a cull. The ewes marked as dry would include not only those which had not conceived but also those which had aborted early and which are indistinguishable from the former. Also included might be some which had lost their lambs. If these latter repeat this performance the following year and earn a red tag, they are probably deserving of culling, though we have insufficient data on this point. I would expect not more than 30 ewes, mainly 4-tooth, to fall into the red tag category.

Shearing of the ewes and weaning would be carried out during the last week of November. At shearing time culls would be removed and disposed of at the first opportunity. Included in these would be a small proportion of ewes in very poor condition assumed to be sheep of poor "constitution". It is my experience that these few ewes are seldom twin bearers and can well be spared from the flock. After shearing the ewes are run as one mob.

It is now that fern control can be more seriously tackled by concentrating the maximum number of mouths and hooves on each of the paddocks concerned in quick succession. Mob grazing is the most effective technique and imposes the least hardship on the stock, because with a large mob the paddock changes are quick and the feast is not followed by a slow, prolonged famine as with small mobs.

The older dry cattle are best used to deal with tall fern and large areas of this are probably best burnt in autumn and oversown. Burning and oversowing are most effective in eliminating hard fern and in my opinion are the only worthwhile method. Ewes can deal with the new bracken fronds still in the tender stage, which is the stage at which fern regrowth is most efficiently controlled.

Early in January the 5-year-old ewes are picked out and culled for sale as a genuine age-marked line guaranteed sound in mouth and udder. These for the next month are grazed separately to achieve good forward store condition by sale time. The remaining flock continues to be mob grazed and as followers to the hoggets as required, but must be kept in good store condition. Loss of condition is, however, seldom a problem at this time of the year.

Hogget Management

Throughout October and November in an average season pasture production is outstripping animal needs, so that areas can be taken out of use and shut up to provide early weaning feed. In a good season lambs weaned in January may be up to a maximum of only 4 lb. heavier than lambs weaned in November, owing to the milk available over the extra 5 weeks. In a poor season lambs weaned early on spelled paddocks are likely to be up to 4 lb. heavier than late-weaned lambs. The little extra milk available in this case is more than offset by ewe competition with the lamb for available grass.

The advantage of early weaning, however, does not lie in any extra weight obtainable, which in any case is of small order, but in the flexibility of management which is available in both pasture and stock. Weaning in January is too late, for example, for effective fern control with ewes. The weaned lambs are drafted by sex into two mobs and these are set stocked in the spelled paddocks until the ewe shearing is completed and lamb shearing can be commenced.

All lambs are shorn, though as my country improves I expect to take a draft of fats from the wethers and these would be picked and sold before shearing. At shearing all ewe lambs are vaccinated against scabby mouth. After shearing the lambs are given the pick of pastures ahead of all other stock, and the wether lambs eventually disposed of at lamb fairs. At the same time the ewe lambs are lightly culled and these sold also.

Our data show that differences in live weight between lambs at weaning time are largely maintained throughout their first year and that the smaller ewe lambs make smaller 2-tooth ewes. Furthermore, though the number of twins is not high, and seldom exceeds 16 per cent of the lambs, these tend to be of average live weight on this country. Culling, therefore, will not constitute selection against twins as is commonly believed.

The cull ewe lambs will consist of the smallest lambs, any with undershot jaws or like serious defects, the few poor ones, and the odd one culled at shearing for serious fleece defects such as "doggy" britch or pigmented fleece. This will reduce my ewe hogget flock from 500 (90 per cent lambing) to 450 to be wintered.

Throughout January and February the hoggets will cause me no concern in an average season. They will continue to be rotated round the best pastures available ahead of all other stock and maximum live weight gains of up to 3 to 4 lb. per week will be aimed at.

If the season is unusually dry, pastures over the entire farm will soon become short and well controlled, a state of affairs conducive to a rapid response to rain, particularly if topdressing has been completed.

It is this rapidly grown fresh autumn feed that seems to cause hogget ill-thrift. If hoggets commence to "go back" on what is normally regarded as plentiful well controlled pasture some alternative feed is essential. This cannot be produced overnight and it is too late to consider its provision only when it is needed. Early in December I will therefore shut up about 80 to 100 acres well prepared by cattle to provide mature grass for hoggets if and when needed in autumn. It will not be used until it is needed and then as sparingly as possible. By set stocking it will normally provide for the hogget flock for 6 to 8 weeks or more and a weekly live weight gain of up to 2 lb. can be expected. Should this area be insufficient, my 10 to 12 acres of chou moellier early sown in October should be ready to use with good results from the end of April onward.

Drenching of the hoggets would be carried out as a routine about 2 weeks after the weather first breaks and drenching will be followed by a change to a fresh pasture spelled from sheep and prepared by cattle. This drenching is a precaution against the

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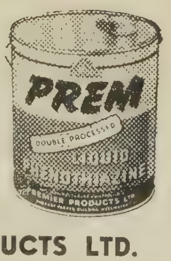

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large stomach worm (*Haemonchus*), the only important parasite of well fed hoggets. Phenothiazine will be used because of its high efficiency. The cost of material will be the equivalent in value of only 4 to 5 hoggets, a small outlay which may save a loss many times larger than this. Drenching repeated twice more at about 3 to 4 weekly intervals should normally be all that is required and relieves me of that constant vigilance required to pick the first signs of anaemia, the symptom of haemonchosis.

In spite of my insurance scheme, my hoggets will be looked at closely at least weekly to pick the first signs of ill-thrift and make the necessary paddock change, which will be immediately preceded by drenching. With this system of hogget management I do not expect losses to exceed 1 to 2 per cent.

From June onward my hogget worries are over and all is plain sailing. My only problem is the provision of sufficient feed to keep them growing as well as possible. This has been my objective since weaning, because I know that hoggets well reared through their first winter will give a much better lambing percentage as 2-tooth ewes than hoggets poorly reared, even though by mating time their weights are similar. The difference can be as much as 12 to 15 per cent.

Hogget shearing will be done in early November, before which culling will be done mainly on wool and face cover, and little attention will be paid to size except to eliminate obvious runts which we know will still be small even as 4-tooth ewes and poor wool producers as a consequence. I have stated that the well reared flock of hoggets will be the more fertile. Within the flock, however, the largest are not the more fertile and the smallest the less fertile. Culling for size, therefore, will be on the grounds of wool production and not fertility.

Within the flock we know that woolly-faced sheep are less productive than open-faced sheep in terms of fertility and weight of lamb weaned per 100 ewes, and this difference is most marked in 2-tooth ewes, where the open-faced sheep of the flock can be up to 50 per cent more productive. In my hoggets, therefore, I cull primarily to eliminate the most woolly-faced ones and cull for wool mainly to eliminate the extremes in fineness and type and serious faults.

Rams

The rams are Romneys and range in age from 2-tooth to 4-year-olds, and each year 8 2-tooths are purchased. In selecting these I aim to buy the more open-faced rams from a breeder with a flock of high fertility. Recent findings of Mr Inkster indicate that an open-faced ram from a flock of low fertility is probably less desirable than a more woolly-faced ram from a flock of high fertility. I need hardly state that at present the rams I require are difficult to locate. The other characters required in my rams apart, of course, from general soundness and development are a good, heavy fleece, good staple and freedom from major wool faults, and a count of between 46-50's which should leave me fleeces mainly in the 48-52's range. On my country such wools are both well grown and of good weight.

My rams have been vaccinated against brucellosis and if the rams bought have not been vaccinated already I would have this done immediately by my club veterinarian. I would like also to have my rams semen tested before use, but at present such a service is not available.

Cattle

I have already indicated that my policy envisages a decrease in heavy cattle numbers and an increase in breeding cows and young stock once the initial breaking in of the country has been largely achieved. I believe, too, that much initial breaking in of the country is more cheaply achieved by fire, oversowing, and topdressing than by "hammering" cattle.

To use cows to maximum advantage on this farm requires a more systematised policy than is generally practised. The bulls are put out separately during November and removed at the end of January, when the calves are also weaned at an average age of about 4½ months. Trials at the Hill Station contrasting early and late weaning have indicated that the difference between calves weaned in January and those weaned in May may reach a maximum of 40 to 50 lb. live weight in the first year, but that by mating time at 2 years old this difference has practically disappeared. In most years the maximum difference in the first year has not exceeded 15 to 20 lb.

Early weaning means that the cows are unencumbered and available for work from February to late June, and over this period surplus condition may usefully be worked off them without any risk. Over July they should, however, be brought up in condition if low or held in good store condition before calving. For this purpose hay and/or crop is advantageous and in a good season some autumn-saved pasture is used.

My country does not lend itself to easy haymaking and baling is out of the question. Hay, therefore, is bought when cheapest and stored in the hay barn. The 1,800 bales which can be stored meet my requirements for 2 average years in protecting the ewes against facial eczema and for slightly steaming up the cows before and during early calving. Hay feeding is used also to further the crushing and seeding of dirty sidelings and standing manuka burns, which ensures maximum returns for the annual expenditure of £150 to £200 on hay.

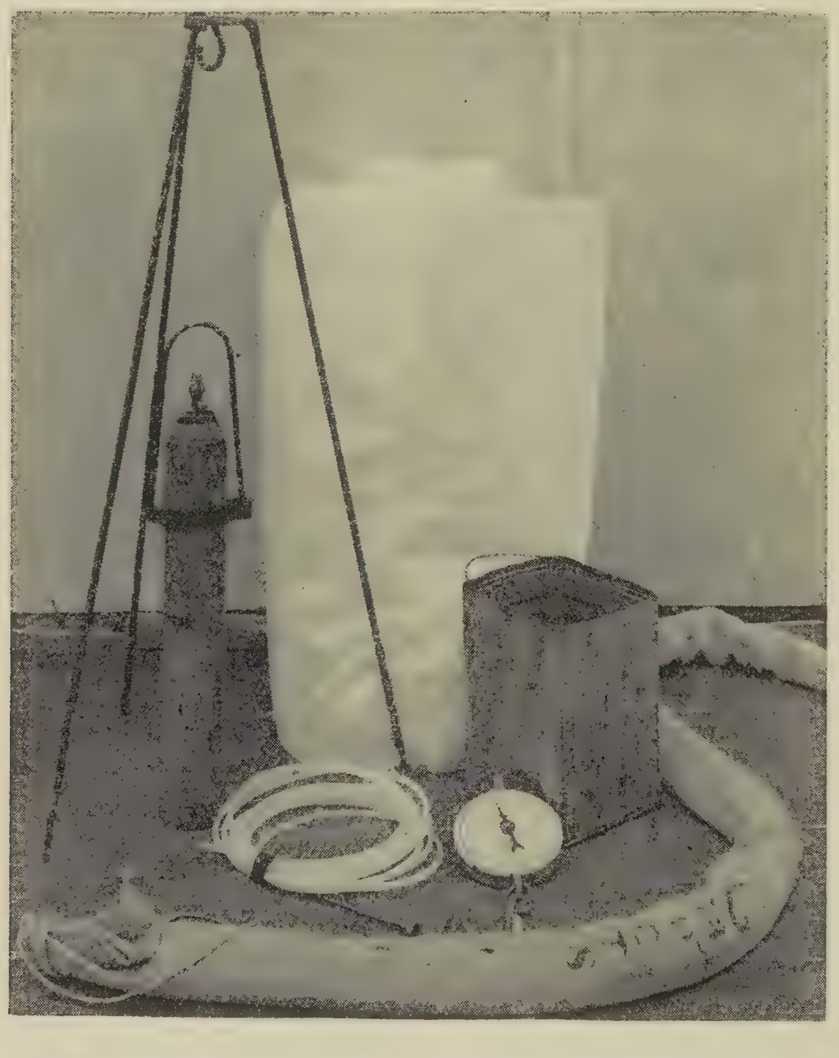
Sheep are easier to winter than cattle, thus, in general, 10 to 12 acres of swedes is used for cattle rather than the sheep. The similar area of chou moellier has manifold uses. If sown in early October, it is a useful standby, if needed for hoggets in the autumn. It will provide safe feed during facial eczema periods, and in late winter can be used either by the cows or young stock, but if earlier use has resulted in considerable regrowth, I prefer to use this with dry cattle or with sheep because of the real risk of redwater, if fed to breeding cows. Break feeding with a run-off is the rule with the cows.

Pregnancy diagnosis is carried out on the cows in April or May and those not in calf are removed from the breeding herd and run with the dry stock until November, when they join the herd again, along with the 2-year-old heifers. At this time the yearling heifers are vaccinated against brucellosis by my club veterinarian. All heifers on entering the herd are individually identified with numbered aluminium ear tags. These serve instead of age marks and are cheap, as easy to apply, and have the added advantages of enabling an easy check on shy breeders as well as enabling a ready summing up of the merits of each bull and a decision, if necessary, on which is leaving serious faults such as bad feet.

My herd of 60 cows with a calving of 85 to 90 per cent provides herd replacements with ample scope for culling for age at 7 years as well as for faults and poor development in the young stock. It also provides 25 steers annually, which, between 2 and 3 years of age, are valuable implements for the hardest going and at between 1 and 2 years play an easier but worthwhile part. The 2-year steers, the cows, and the 1-year steers in that order of merit provide a worthwhile range of implements in the present state of farm development. This number of steers alone would be comparatively useless for the work required, but as a complement to a working herd of 60 cows and the ewe flock play a valuable part. In a few years only, the herd will play a far more profitable role in production of stock primarily for fattening.

Control of Wax Moth on Comb Honey and Stored Bee Combs

By D. ROBERTS, Apiary Instructor, Department of Agriculture, Auckland, and E. SMAELLIE, Superintendent, Beekeeping Industry, Department of Agriculture, Wellington



Complete equipment required for fumigation of comb honey and stored bee combs consists of a cylinder of methyl bromide with a length of polythene tubing and a release valve, enough plastic sheeting to cover the material to be fumigated, a dial-type spring balance, a tripod for supporting the cylinder and the balance, and sandbags for sealing the plastic sheeting to the ground or floor. The type of sandbag shown, though satisfactory, is not as efficient as the type recommended in the article.

TWO species of moths, the larger wax moth (*Galleria mellonella*) and the lesser wax moth (*Achroia grissella* Fabr.), notable for their attacks on comb honey and stored bee combs, are widely established in New Zealand. Because of the destruction they cause to stored comb honey and bee combs both are responsible for considerable annual financial loss and inconvenience to beekeepers, particularly in districts where mild temperatures favour proliferation of the pests. Effective control and destruction of these pests are best obtained through the continuing use of highly poisonous gaseous fumigants which are equally lethal to humans and must be handled with extreme care at all times. This article describes the application of methyl bromide, the most effective of all fumigants for this purpose, by a method which provides very complete control with maximum safety for the operator and which has been approved by the New Zealand Department of Health.

THE moths do not attack stored combs only, but also the combs of active colonies. Though the damage caused in these circumstances is often sufficient to destroy a colony, control is simply a matter of good management and the maintenance of strong, vigorous colonies, which will not tolerate the presence of these moths and will destroy the larvae as they appear. Moths become a serious menace only where colonies are neglected and allowed to become seriously weakened and improperly housed.

Though control of infestation in the apiary is primarily a matter of good management, it must be recognised that while the bees in well managed apiaries will not allow the moths to gain sufficient hold in the hive to create great damage, eggs of the moths are frequently present on combs or in the cracks and crevices of frames and hive bodies. When the combs, frames, and hive bodies are taken from the bees and stored at ordinary and higher temperatures the eggs will hatch and the larvae develop without hindrance from the bees. It is in these circumstances that most damage occurs, and immediate satisfactory control is essential if the combs and honey are to withstand storage without loss.

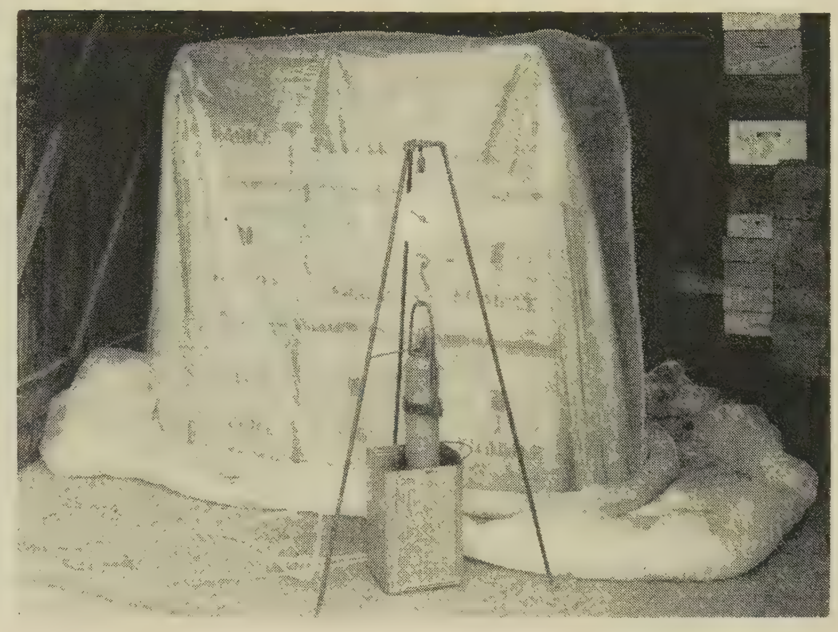
Conditions Favouring Moth Eggs

The wax moths' habit of laying their eggs on the surfaces of combs and in the crevices of frames and supers makes it impossible to ensure that such material is free of infestation without fumigation. Dependent on temperature, the eggs will hatch in periods varying from 5 days to some weeks. The higher the temperature is, within limits, the more rapidly the eggs will hatch. Comb honey and bee combs stored in sheds and hot rooms will often be held at temperatures some degrees warmer and more constant than those outside.

In these conditions development of the eggs will be rapid with the possibility of irreparable damage being caused to the stored material within a few weeks. The most efficient fumigating agent for controlling wax moth infestation of stored combs and honey is one which will kill the eggs as well as the adult moths and larvae. Because the honey may be used for human consumption and the feeding of bees, and the bee combs for the further storage of honey and pollen and the rearing of young bees, any agent used must be one which will not leave poisonous residues or undesirable odours or flavours in the honey and beeswax of the combs.

The number of fumigating agents which can be used to control wax moth is very limited, and of those **readily available** in New Zealand and suitable for general use by commercial apiarists only methyl bromide destroys eggs, larvae, and adult moths at the one application.

Before the development of present techniques the use of methyl bromide for wax moth control was not practicable unless a gas-tight room was available. Because of this and the difficulty in measuring small quantities of the gas it has not been much used for this purpose.



Cases of section comb honey being fumigated before export. The same method is used to fumigate stored bee combs.

Use of Methyl Bromide

Because of the development by commercial interests of techniques whereby methyl bromide can be safely used for fumigation of foodstuffs and other material in amounts from a few cubic feet upward, without the need of a gas-tight room, commercial beekeepers can now use this fumigant for the control of wax moth.

Methyl bromide is particularly suitable for controlling wax moth in that as well as destroying all stages of the moth from the egg to the adult, it has a very low degree of solubility in water, which is an important factor because of honey's relatively high natural moisture content. As it has no corrosive action on metals other than aluminium, it will not cause corrosion of the nails and metal rabbets in supers.

Because some formulations of methyl bromide have chloropicrin incorporated as an agent to give the gas a readily detectable odour, it is important to ensure that only pure methyl bromide is used for the fumigation of bee combs and honey.

Equipment Needed

Methyl bromide 100 per cent is widely used by commercial operators for large-scale fumigation work and by the Department of Agriculture at its Plant Quarantine Stations. The Department uses large steel cylinders where the fumigant can be applied under a high degree of vacuum. This method is more economical of the gas and gives very thorough penetration in a short period. In addition, fumigation is also done at atmospheric pressure in the cylinders and in vaults and under sheets. Commercial operators use various methods including the one considered suitable for wax moth control, that is, the application of gaseous methyl bromide to the material to be fumigated under plastic sheeting.

The plastic sheeting is impervious to the gas and provided it is well held down around the edges, will retain the gas for long periods. Methyl bromide is obtainable from suppliers in liquid form in pressure cylinders containing from 5 lb. of gas upward, depending on size. The equipment necessary for the fumigation of comb honey and bee combs consists of:

1. A cylinder of methyl bromide, complete with a length of polythene tubing and release valve.
2. Plastic sheeting (for example, polythene or polyvinyl chloride, known as PVC) of the required size to cover the material to be fumigated.
3. A dial-type spring balance.
4. A tripod for supporting the cylinder and the balance.
5. A number of sandbags for sealing the sheeting to the ground or floor.

The sandbags for sealing the sheeting to the floor can be made by the beekeeper. These are cloth bags made in the form of a cylinder 3 ft. long and 3 to 4 in. in diameter when completely filled. A closely woven strong cloth such as khaki drill or similar material is suitable. The bags are **loosely** filled with fine sand so that when they are used the looseness will combat any inequalities in the floor. The sandbags must be kept dry if they are to provide a good seal.

The cylinder of methyl bromide with its tubing, the plastic sheeting, and the tripod can be obtained from suppliers. It is most important that only the correct type of plastic sheeting (for example, polythene or PVC) be used, as not all plastics are impervious to the gas. Rubber tubing and sheeting must not be used, as the methyl bromide reacts chemically with the sulphur in the rubber and causes rapid breakdown with its attendant danger of gas leakage, and also the development of unpleasant odours and flavours in the honey and combs. The dial-type balance can be obtained from dealers in weighing machines.

Methods of Use

Supers of combs or supers or cases of comb honey to be fumigated are placed in stacks on an even floor. The floor should preferably be of concrete, but where only wooden floors are

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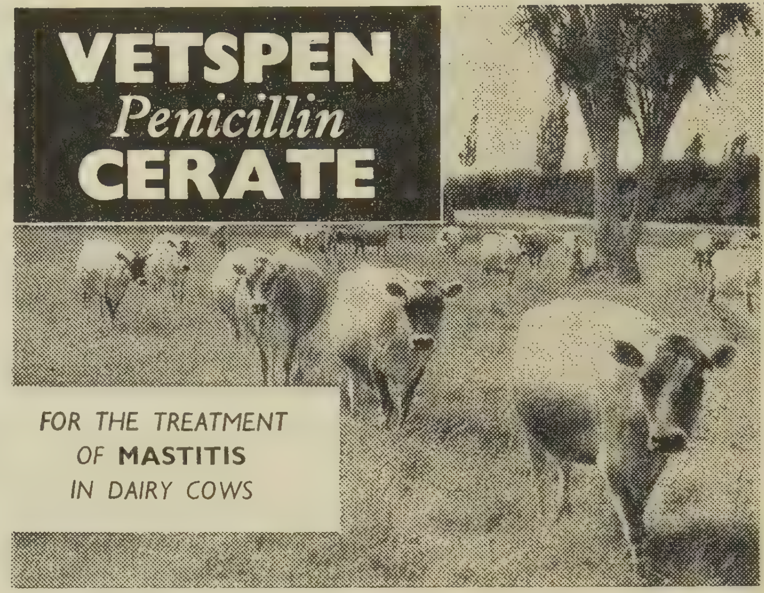
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available the portion to be used should be covered with a reasonably gas-tight material. Because of the rapid rate at which methyl bromide gas diffuses into the atmosphere ordinary wooden floors will allow too rapid an escape of the gas and the treatment will be ineffective. Floors of this type can be made suitable if they are given two or more coats of material such as that used for undersealing motor vehicles and then covered with good, sound linoleum.

If the fumigation is to be done outdoors and the ground used as a base, the area should be well levelled off beforehand and the ground damped down so that a good seal is obtained.

When the material has been stacked it is covered with a sheet of plastic. The sheet must be large enough to allow a good margin all round on which the sealing bags can be placed (see the illustration on page 465). The plastic sheeting is made up by suppliers in any size needed.

Before the material is covered with the sheeting the top surface and corners of the stack should be covered with clean soft sacking or similar material so that the plastic is not allowed to come into contact with any rough surfaces which could tear it. Before the sealing bags are placed in position the inlet tube from the cylinder of methyl bromide is led up under the sheeting to the top of the stack and fixed in place with plastic tape. The sealing bags are then placed in position, care being taken to ensure that the sheeting is not folded badly so that a good seal cannot be secured.

With the inlet tube and sealing bags in place the next step is the introduction of the methyl bromide. Before the methyl bromide is released the hose clamps should be inspected to ensure that they fit tightly and do not allow any gas to escape.

As mentioned earlier, methyl bromide is supplied in pressure cylinders in liquid form. The liquid will gasify readily at atmospheric temperatures of 49 degrees F. and over. To ensure that the liquid gasifies readily the cylinder of methyl bromide should be stood upright in a container of warm, **not very hot or boiling**, water while being used.

The gas should not be released unless the cylinder is in an upright position, and the valve should be opened immediately the cylinder is put in place.

As the methyl bromide is under pressure in the cylinder, an accurate means of determining the amount released is necessary. This is done by suspending the container of warm water with the cylinder to the hook attached to a dial-type spring balance (see the illustration on page 465). The total weight of the container of hot water and the cylinder of methyl bromide as registered on the dial is noted and then the release valve is gently opened. As the gas is released the weight shown on the dial decreases.

With this method the amount of methyl bromide released can readily be determined to within 4 oz. Platform or other types of scales giving similar readings can easily be adapted for this purpose.

After the methyl bromide has been introduced the hose is pulled out and the fumigated material left sealed under the cover for 24 hours. To ensure proper dispersal of the gas when it is released under the cover the loose portion of the sheeting should be gently pulled in and out a few times to cause agitation of the air. If very large stacks are to be fumigated or the air temperature at the time is below 50 degrees F., the air within the stacks should be thoroughly agitated by an electric fan for 30 minutes after introduction of the gas.

Dosage of Methyl Bromide

In experimental work methyl bromide at the rate of 1 lb. to 500 cub. ft. at atmospheric pressure was found to give completely satisfactory results when the material was subjected to this concentration for 24 hours. At temperatures of 50 degrees F. and over 24 hours will be found ample. Where temperatures fall below 50 degrees F., as may happen where the material is being treated in the open, 48 hours should be allowed.

Safety Precautions

If the fumigation is done indoors, the operator should vacate the building immediately the appropriate amount of gas has been introduced and should not allow entry to any person until the gas has been dispersed and the building thoroughly aired. This precaution must always be taken to obviate the risk of inhaling gas that may have escaped through improper sealing down of the plastic sheeting or by leakage through unseen perforations.

Though pure methyl bromide in gaseous form is odourless, tasteless, and colourless, its presence can always be detected by the use of a halide light such as are used by refrigeration servicemen. These are specially constructed torches available in two types, one using acetylene gas as a fuel and the other methyl alcohol. When the torches are introduced into air containing dangerous proportions of methyl bromide the colour of the flame changes to a light green that deepens as the concentration becomes heavier. Where methyl bromide is used in enclosed buildings the use of a halide light is essential for maximum safety.

Though methyl bromide is an extremely poisonous gas, this method of application provides for the maximum degree of safety in its use. With ordinary care and common sense there is no need with this method for the operator to come into contact with the gas at any stage.

The methyl bromide can be dispersed by removing the sandbags on both ends of the stack and lifting the plastic sheeting a foot or so. If the fumigation has been carried out in a room or building, all windows and doors should be opened before the sandbags are lifted, so that there is as much draught as possible while the operator is in the room. Once the bags have been removed and the sheeting lifted, the operator must leave the room immediately and should not re-enter until the room has been thoroughly ventilated for 12 hours or more.

If the fumigation is done outside, the operator should remove the bags and lift the ends only of the sheeting as quickly as possible and then allow the material to air thoroughly for at least 1 hour before finally removing the sheet and handling the fumigated material in any way.

It is essential that these procedures in the use of methyl bromide should always be strictly observed. As already stated, it is highly poisonous to humans and in addition is colourless, odourless, and tasteless. Though heavier than air, its rate of diffusion into the atmosphere is much more rapid than that of other fumigants generally used for wax moth control. As it may tend to concentrate in the lower portions of any space being fumigated, it should not be used in enclosed rooms with little natural ventilation unless adequate forced ventilation can be provided.

Provided that material fumigated is allowed to air properly, methyl bromide does not leave residues which will harm either eggs, larvae, or adult honey bees or cause off flavours, undesirable odours, or discolouration of comb honey or bee combs.

Results of Experiments

Experimentally, bee combs and honey in the comb were fumigated with methyl bromide at 1 lb. of methyl bromide to 500 cub. ft. under high vacuum. This ensured that diffusion of the fumigant through the honey and beeswax was much more complete and thorough than it would be under atmospheric pressure.

The fumigated bee combs after airing were then placed on strong colonies of bees from which all brood combs but one containing uncapped brood had been removed. The queen was confined below an excluder in a brood chamber which was filled with the fumigated combs, together with the remaining comb of brood. During observations of these colonies over 3 weeks no ill effect from the fumigated combs on eggs, larvae, or adult bees was discernible.

Honey in the comb similarly treated was placed in other colonies from which all stores of honey were removed, so that the bees had to draw on the fumigated honey for sustenance for both adult bees and larvae. Again there were no discernible ill effects and all test colonies flourished equally with controls.

Section comb honey similarly fumigated with methyl bromide under vacuum has been subject to tests for off flavour and odour and has been found unimpaired in any respect.

Plastic Sheeting

Before plastic sheeting was used, methyl bromide, because of the rapidity with which it escapes into the atmosphere, was not suitable for wax moth control unless a gas-tight room was available.

With the use of plastic sheeting this very effective fumigant can now be used by beekeepers with safety and high efficiency without the outlay and trouble necessary to construct gas-tight rooms. The use of plastic sheeting enables existing comb rooms which are not gas tight to be used, and where necessary enables the fumigation to be done successfully in the open. In addition to providing a gas-tight seal during fumigation, the sheeting, after the gas has been released, can be sealed down again with the sandbags to prevent further infestation.

The grade of polythene recommended for inside use is the clear 300 gauge, which is .003 in. thick. The price for this grade made up into the required size is about 2¼d. per square foot. This clear grade is strong enough to withstand normal careful handling over long periods, but is not recommended for extended outside use, as it has a tendency to deteriorate after exposure to 100 hours of sunshine.

For outside use a black polythene sheeting .005 in. thick known as 500 gauge is recommended. This has a much extended life in the open and will prove much more economical in use where the sheeting has to be left in place to provide protection against the weather and/or prevention of further infestation. Being about twice the weight of the clear 300 gauge, it is, of course, more expensive, costing 4½d. per square foot.

Where PVC sheeting is used it will require to be not less than .007 to .008 in. thick. Because of its greater weight per square foot it is much more expensive. As PVC is not manufactured in New Zealand, it is not so readily available at present as polythene and the cost is relatively high, being about 10d. per square foot made up.

PVC sheeting must not be allowed to come into contact with liquid methyl bromide, as the liquid will cause a rapid breakdown of this material.

Care in handling and storing the sheeting will help to ensure maximum life. When the sheeting is in use care should always be taken not to walk on the portion used for sealing, as this may perforate it. Any small holes or leaks can readily be repaired with a self-adhesive PVC tape sold for the purpose. When not in use the plastic sheeting should always be carefully folded and stored where mice and rats cannot reach it.

Cost of Equipment

Initial costs of equipment necessary to fumigate stacks of material of up to 500 cub. ft. content are:

Item	Approximate cost		
	£	s.	d.
1 sheet of clear polythene 26 ft. 10 in. x 28 in. (sufficient to cover a stack of supers 7 high, 6 wide, and 6 long, a total of 252 supers)	6	16	6
1 steel pressure cylinder to hold 5 lb. of methyl bromide (this is returnable)	4	0	0
Dial-type spring balance scale ..	3	10	0
Material for tripod, cloth for bags, polythene plastic tubing, etc.	2	10	0
Estimated total	16	16	6

Thereafter, actual costs of fumigation will be governed by the amount of methyl bromide used. Methyl bromide supplied in lots of 5 lb. costs 8s. 6d. per pound. Halide lights are available from suppliers of refrigeration equipment for about £4 5s. upward. Where the acetylene type is used the cylinder of acetylene will be an additional charge.

Toxicity of Methyl Bromide

Though the new techniques allow safe and efficient use of methyl bromide, users must bear in mind that this fumigant is equally as toxic to humans as other fumigants such as cyanogas and carbon disulphide, both of which are already widely used for wax moth control. Because of the dangerous nature of all these fumigants strict precautions must always be taken against any possible inhalation of the gases.

The lack of odour, taste, and colour associated with pure methyl bromide, together with the delay (perhaps several hours) before symptoms of poisoning appear, make it essential that this fumigant should always be handled with extreme care. Neglect of safety precautions may lead to exposure to poisonous concentrations of the gas. Usually there are little or no **immediate** effects, symptoms appearing only slowly.

Symptoms of Poisoning

The symptoms consist of: Dizziness; blurring of vision; lassitude and sensation of profound fatigue; staggering gait; slurring of speech; nausea and vomiting; loss of appetite; abdominal pain; and convulsions.

Any person developing such symptoms after suspected exposure to methyl bromide should have qualified medical attention immediately. Pending the arrival of the doctor the patient should be kept in fresh air, remain in a reclining position, and be kept comfortably warm. If a doctor is not available immediately, the patient should be taken to the nearest hospital forthwith.

Methyl bromide in gaseous form is not inflammable or explosive.

Acknowledgment

To the New Zealand Department of Health for information and advice on symptoms and treatment of over exposure to methyl bromide, and to Fumicide Laboratories Ltd. for material for photographs and field tests.

Photographs by Sparrow.

Vaccination Against Contagious Abortion

APPLICATIONS by farmers for vaccination of their calves against contagious abortion in 1959 are due now. Applications should be sent in as early as possible so that vaccinating officers can arrange the work efficiently.

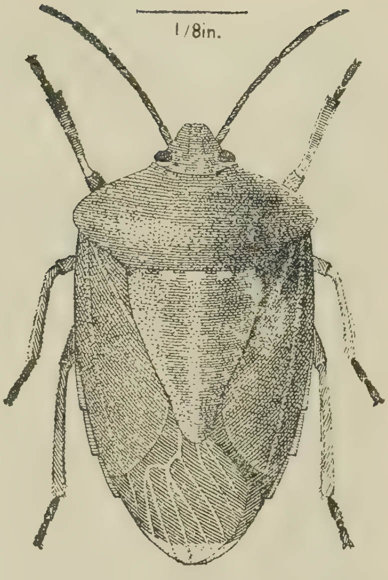
Members of veterinary clubs should apply to the secretary of their club and other farmers should apply to the nearest Livestock Instructor of the Department of Agriculture or private veterinary surgeon. Applications to Livestock Instructors must be accompanied by a cash payment of 2s. per calf. Application forms can be obtained from any Livestock Instructor.

The closing date for applications for dairy calves is 14 January and for beef calves 31 July. The charge for vaccination is 2s. per calf irrespective of the number.

The Green Vegetable Bug

By P. EVERETT,
Assistant to Horticultural Superintendent, Department of Agriculture,
Auckland

THE insect known as the green vegetable bug (*Nezara viridula*) has become a troublesome garden pest in many parts of the North Island of New Zealand since it was first recorded in 1944 attacking bean crops in New Plymouth. It is also present in the South Island in parts of Nelson and Marlborough Provinces, though its depredations there are not serious. This article describes its spread and habits and gives control measures, including control by an introduced parasite.



An adult of *Nezara viridula*. The three white dots along the front margin of the central triangular plate distinguish it from other shield-shaped insects.

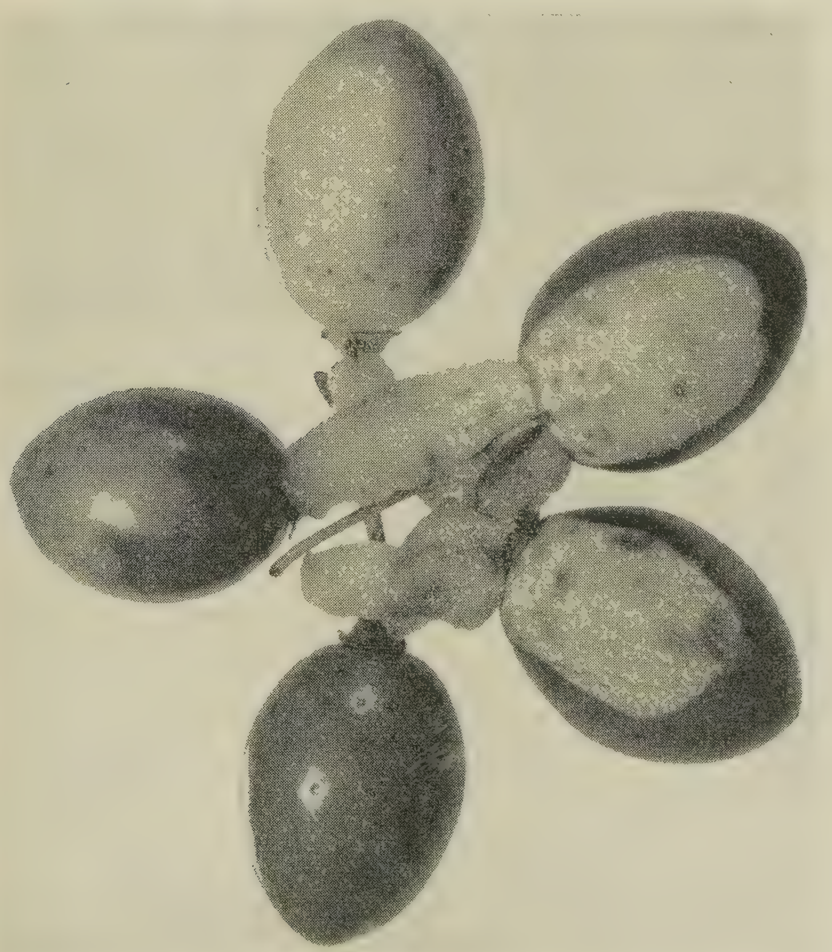
AS a full account of *Nezara* was published in "The Journal of Agriculture", December 1949, and the pest is so well known in most parts of New Zealand, only a cursory description of the insect and its feeding habits and life history will be given here.

The eggs of the bugs are deposited in groups of 60 to 80 eggs known as rafts, which are generally glued to the under side of foliage. The rafts resemble miniature honeycomb. After emerging the bugs grow by a succession of moults, the colour changing with each moult. The adult is shield shaped, about ½ in. long, green, and has two pairs of fully formed wings.

The bug is seldom seen in flight except when disturbed and then only for a relatively short distance. Natural flights are most often made at dusk. The adult bugs hibernate during the cooler months of the year in sheltered positions such as long grass, dense foliage, and under the loose bark of trees.

Nezara in all its stages feeds by pushing the fine mouth parts into plant tissues and sucking the sap. This causes the collapse of the plant cells adjacent to where the bug has been feeding, resulting in the tissue becoming corky and usually creamy or brownish. As the bug has sucking mouth parts it is incapable of chewing plant tissue and so causing obvious mutilation.

Fruits of tomato, tree tomato, peach, and pear on which the bugs have been feeding are not greatly disfigured, but their edible quality may be seriously impaired. Beans are a favourite host plant and when young pods are attacked they may shrivel and fail to mature. Though large numbers of bugs are often found on silver beet, the plants generally show no injury, pos-



[*Sparrow*

← Tree tomatoes damaged by green vegetable bugs. The two partly peeled fruits at right show that the injury penetrates well into the flesh of the fruit.

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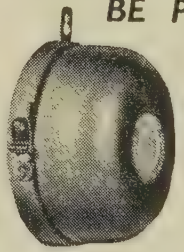

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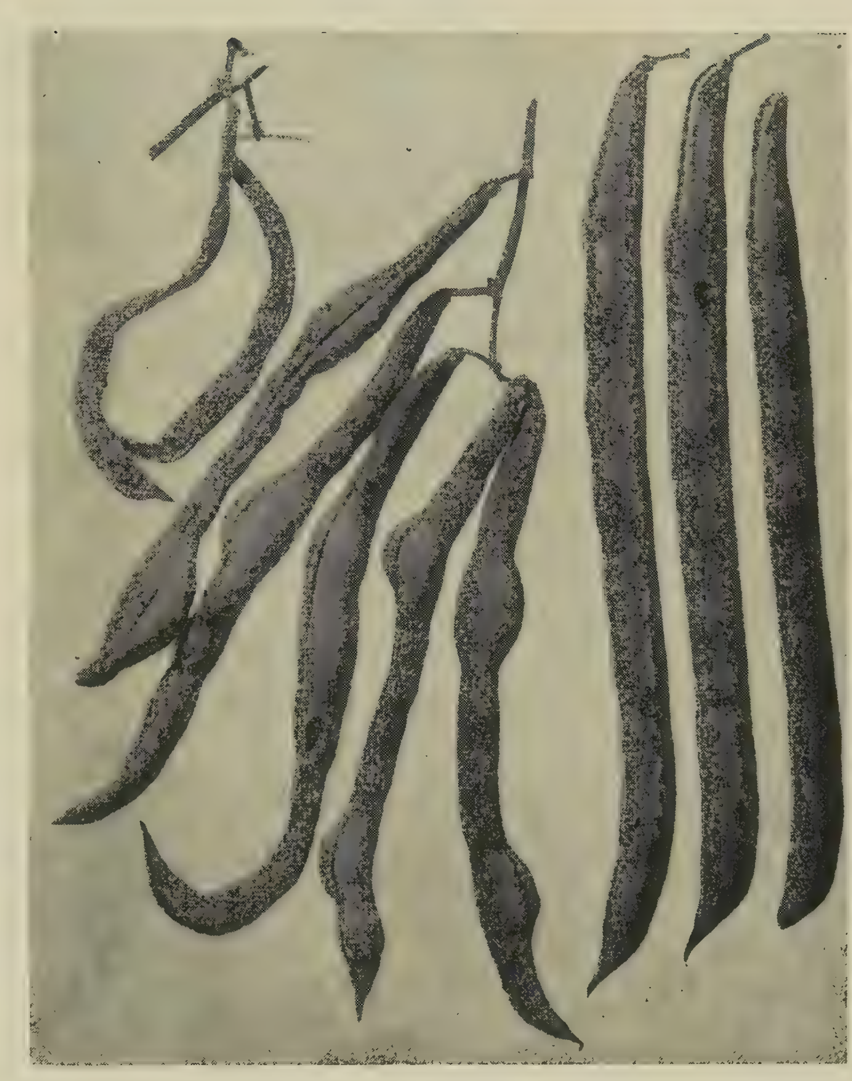

[*Sparrow*

The runner beans on the left have been damaged by green vegetable bugs; the three on the right are undamaged.

sibly because the bugs use the plants for shelter rather than for feeding, though they are known to feed on silver beet to some extent.

Spread and Degree of Infestation

Though *Nezara* was present in New Plymouth in 1944 and had spread throughout Taranaki Province by about 1949, last year it was not a serious pest of commercial vegetable crops in that area. However, in domestic gardens the pest sometimes causes appreciable damage, especially on bean crops maturing in autumn.

The position in Northland is very different. Early in 1946 a few gardens at Kawakawa were found to be infested. During the following 3 years infestation spread to the whole of Northland and in many parts was extremely severe on almost every kind of vegetable crop grown. Since then green vegetable bugs have remained a serious garden pest in Northland, though there is some variation from season to season in the degree of infestation.

It is reported that because of the pest some household gardeners no longer attempt to grow vegetables such as autumn crop beans that are favourite host plants for it. For the same reason many commercial growers of tree tomatoes in Northland, Auckland, and Bay of Plenty now find it necessary to use systematic control measures each season. In some domestic gardens where no attempt has been made to control the bug the entire crops of tree tomatoes have been made practically useless. In recent years, both in Auckland and Northland, appreciable damage has been caused to peaches in some commercial orchards and some damage to pear crops.

The growing shoots of citrus trees are sometimes killed by the bugs feeding on the sap. The bugs also feed on citrus fruits, especially during autumn. No injury has been observed to the pulp of citrus fruits, though appreciable dropping of affected fruits, especially mandarins, before reaching maturity has been reported from the far north.

In 1954 in one commercial orchard of Paragon peaches near Hokianga Harbour the infestation of bugs was particularly severe. The trees were then in their second year of growth and damage by the bugs rendered all the fruits unfit for use. When the crop had been disposed of as many as 50 bugs clustered around the crotches of some trees during autumn. The feeding of the bugs caused extensive gumming and a swelling at the bases of the main branches. The swelling increased in later years, but the health and vigour of the affected trees appeared to be normal. In the following year when the pests were again found to be clustering around the crotches of young peach trees control measures were promptly applied before noticeable damage occurred.

The pest was first recorded in Gisborne in 1949 and infestation became general throughout that area by 1952. During the last 5 years the degree of infestation has not changed greatly. In commercial vegetable gardens and in maize crops it is only occasionally necessary to adopt control measures, but in many unprotected domestic gardens appreciable damage to autumn crops is fairly common.

Hawke's Bay Province remained free of the pest until 1952 and it was not found near Hastings until 1955. Infestation is now general through the province and extensive damage to domestic vegetable crops is reported, but so far the damage in commercial vegetable gardens has been much less severe.

In the more southern parts of the North Island and in the South Island *Nezara* does not appear to be a serious pest and except in some domestic gardens control measures are unnecessary. The pest has so far not been recorded south of Marlborough Province.

The depredations caused by the pest appear to be governed mainly by winter temperatures. It is undoubtedly a major garden pest in the far north of New Zealand and becomes progressively less troublesome further south.

Parasitic Control

During the summer of 1948-49, when *Nezara* had become a serious pest in many parts of Northland, the Entomology Division of the Department of Scientific and Industrial Research introduced an egg parasite, *Macrophanurus basalis* Woll. It is a wasp-like insect about 1/25 in. long which lays its eggs in those of *Nezara*. The adult parasite emerges about 3 weeks later. A temporary breeding station was set up in the Bay of Islands area during the summer of 1948-49 and some 48,000 parasites were liberated that season, mainly in Northland, but a few were also liberated at New Plymouth and at Te Kaha (near Opotiki).

Further parasite liberations have been made in all seasons since 1949, but the aggregate number liberated in any one year has been considerably less than the initial liberations. Parasite distribution during this period was extended to nearly all parts of Northland, many localities in and around Auckland, and also Pukekohe, Coromandel, Waikato, Great Barrier and Kawau Islands, Bay of Plenty, Gisborne, Wairoa, Hawke's Bay, Foxton, Wairarapa, and Western Samoa.

Nearly all of the parasites released have been bred and made available by the Entomology Division, Nelson.

As it has been found extremely difficult to locate the *Nezara* egg rafts in the field, it was not possible to make a systematic survey and population-density study as a basis for parasite liberations. Most of the parasites were sent to individuals on request or were supplied to the Horticultural Instructors of the Department of Agriculture, who chose for release localities where there was a high bug population.

No close study of the effect of the parasite on bug population has been undertaken, but observations have been made in many districts by officers of the Horticulture Division. It has been observed that the degree of infestation may vary greatly from year to year in different localities, but the extreme infestation that occurred in many parts of Northland during the late summer and autumn of 1949 has not been repeated.

Though there have been no parasites liberated in or near Te Kaha since early in 1949, parasitised *Nezara* eggs were found in that locality in 1953. Furthermore, the bug population appeared to have declined during that period, though the pest persisted in fairly large numbers. In a suburb of Auckland and in parts of Northland parasitised bug eggs have been found 2 or more years after liberations were made.

These facts and field observations clearly show that the parasite can effect an appreciable degree of control in the warmer coastal areas of Auckland Province. It has also been made clear that the parasite alone cannot be expected to effect satisfactory control of the pest in any part of New Zealand.

The fluctuation in bug population from year to year in some localities may be due to the parasite virtually wiping out the *Nezara* and in so doing wiping out itself. The pest appears to be more mobile and can reinfiltrate these areas and build up to pest proportions before the parasite becomes re-established. There may also be native parasites which influence the incidence of the pest. It is known that poultry and pheasants and possibly other birds can destroy large numbers of the bugs.

Precautions

HETP and TEPP are very poisonous and extreme care is necessary when they are used. The following precautions should be taken:

1. Avoid contact of concentrate with skin or mouth; use rubber gloves if hands have open cuts.
2. Immediately wash off concentrate spilt on the skin, using soap and running water. After spraying cleanse all exposed parts in a similar manner.
3. Keep the insecticides out of reach of children.
4. Do not eat, drink, or smoke while spraying.
5. Inhalation of spray vapour may cause headaches and tightness of the chest; if this happens, spraying should cease and the area should be vacated.

Control by Therapeutants

Only a limited amount of experimental work has been done in New Zealand to ascertain the most effective means of controlling green vegetable bug by the use of therapeutants.

Since 1950, when Jacks and Cederman demonstrated that the pest could be controlled on french beans by spraying with HETP, this material has been extensively recommended for use on most garden plants. An exception is the tomato plant, which may be injured if sprayed with HETP and for which spraying with DDT has been recommended.

Though a considerable degree of control of *Nezara* can be secured with these materials, many instances have been reported where they do not seem to have given satisfactory control. These apparent failures may have been due, at least in part, to either inadequate spray coverage or, more likely, reinfestation from adjacent areas.

During more recent years many commercial vegetable and fruit growers and also domestic gardeners are reported to have secured satisfactory control of the pest with malathion, lindane, or TEPP. At present, owing to inadequate experimental work, it cannot be stated which of the five materials mentioned is likely to give the best control.

The following comments on the insecticides named should help growers to determine which is likely to prove most suitable for their particular crop and conditions.

DDT 50 per cent wettable powder 1 lb. to 100 gallons (½ oz. in 4 gallons). Slow acting and may take several days to kill. Its use on some kinds of plants is liable to result in an increase in red mite infestation. Can be used on tomatoes without risk of serious plant injury. Beneficial residual effect lasts for 10 to 14 days. Leafy vegetables or beans should not be sprayed within 3 weeks of harvesting.

HETP, 1 pint to 100 gallons (4 teaspoons in 4 gallons), or **TEPP**, ½ pint to 100 gallons (2 teaspoons in 4 gallons). Quick acting. It is necessary for the spray to contact the pest. The residual effect lasts for less than 1 day. Causes injury to tomato plants. Sprayed vegetables can be safely eaten 1 day after being sprayed.

Malathion, emulsion form, 1 pint to 100 gallons (4 teaspoons in 4 gallons). Fairly quick acting. Residual effect lasts probably for several days. Will not cause plant injury. Leafy vegetables or beans should not be sprayed within 10 to 12 days of harvesting.

Lindane 25 per cent wettable powder, 2 lb. to 100 gallons (1 oz. in 4 gallons). Slow acting. Residual effect lasts for a few days only. Will not cause plant injury. Leafy vegetables or beans should not be sprayed within 14 days of harvesting. An objectionable taint in vegetables may sometimes be detected for 21 days or more after spraying with lindane.

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Seed Production in New Zealand

Seed Testing

By A. V. LITHGOW,
Officer in Charge,
Department of Agriculture
Seed-testing Station, Palmerston North

[*Watt*

Seed being counted out for testing.

THE value of seed cannot be estimated from a cursory examination. Careful analysis is required to determine its purity, the types of impurity present, and the germinating capacity of the pure seed. The Department of Agriculture Seed-testing Station at Palmerston North undertakes this inspection and provides the information on which the value of the seed can be based.

IN 1869 the first seed-testing station was established in Saxony by Professor Nobbe. The value of the station was quickly realised, and by the turn of the century most European states had such stations and seed was also being tested in the United States of America. Now all progressive countries have seed-testing stations, both private and official. The keen buyer demands evidence that the seed he buys is good and has been tested by stations whose efficient service is his guarantee.

New Zealand Service

The New Zealand Department of Agriculture was not slow to follow the example set overseas. Under the guidance of Mr A. H. Cockayne and later of Mr E. B. Levy the work in New Zealand developed until by 1918 a sound foundation of seed testing had been laid. In the following years the demand for tested seed expanded steadily.

Without this service seed traders had to attempt to value seed by its appearance, and though they could form an approximate idea of its purity, undesirable weed seeds often passed unnoticed and the germinating power of the seed was unknown. Merchants found that seeds supported by an

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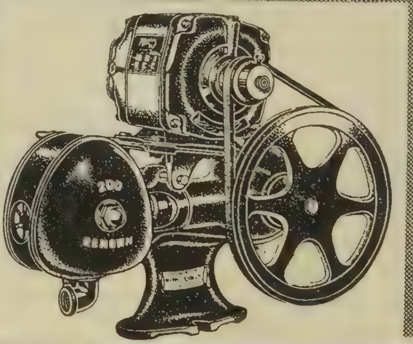

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independently issued certificate were bought more readily by discriminating buyers and were in greater demand overseas. In addition, they found that they themselves could buy more confidently if they knew the purity and germination of a line.

Since 1925 the New Zealand Station has been a member of the International Seed Testing Association, which has aimed at bringing about a more uniform technique in testing. Before this association was formed a variety of methods used in different countries made interpretation and comparison of certificates no easy task. The methods recommended by the international association have been adopted in New Zealand, with the result that in overseas countries complete reliance can be placed on New Zealand certificates. This has greatly assisted the export trade of the Dominion.

In 1910, when the Station was situated in Wellington, the work was regarded as a part-time occupation for one man, and some 180 samples were tested for purity and germination. During the First World War it was transferred temporarily to Weraroa, and by 1918 the number of samples handled annually had risen to nearly 4,000. In 1928 the Station was transferred to Palmerston North; the staff had then increased to 10 and in that year more than 10,000 samples were examined. Today a staff of 70 analysts handles up to 35,000 samples for purity, up to 50,000 samples for germination, 14,000 samples for strains tests, some 3,000 samples for the blind seed service, and investigates seasonal and other problems in seed testing. Further, a research staff of five is available for assisting with any analysis problems.

In 1910 the work of the Station was limited to purity and germination analyses. Though most samples are still subjected to these tests, strains testing of perennial ryegrass by ultra-violet light and of white clover by the picric acid test is also undertaken now. Other services include moisture testing, the pre-harvest examination of ryegrass for blind seed disease, and herbage dissection.

In addition to the routine activities of the Station, considerable investigation work is also done. Research is undertaken into problems associated with seed quality and the technique of seed testing, and no effort is spared to ensure that the New Zealand Station is conversant with overseas findings in this field. Examples of research undertaken by the Station which have been of direct benefit to the farming community include investigations into the application of the ultra-violet light test to perennial ryegrass seed, the picric acid test to white clover seed, and blind seed disease of the ryegrass species.

The Station also provides information for the Purchasing Officer for Seeds, who buys seeds for all Government Departments. With the test results of every worth-while line of seed at its disposal, no organisation is better placed to advise on the purchase of seed at its true worth. When land development is undertaken the department concerned knows that its seed purchases have been made to the best advantage and that the quality will contribute to the success of the venture. In some years over £300,000 worth of seed has been bought for land development through the Purchasing Officer for Seeds.

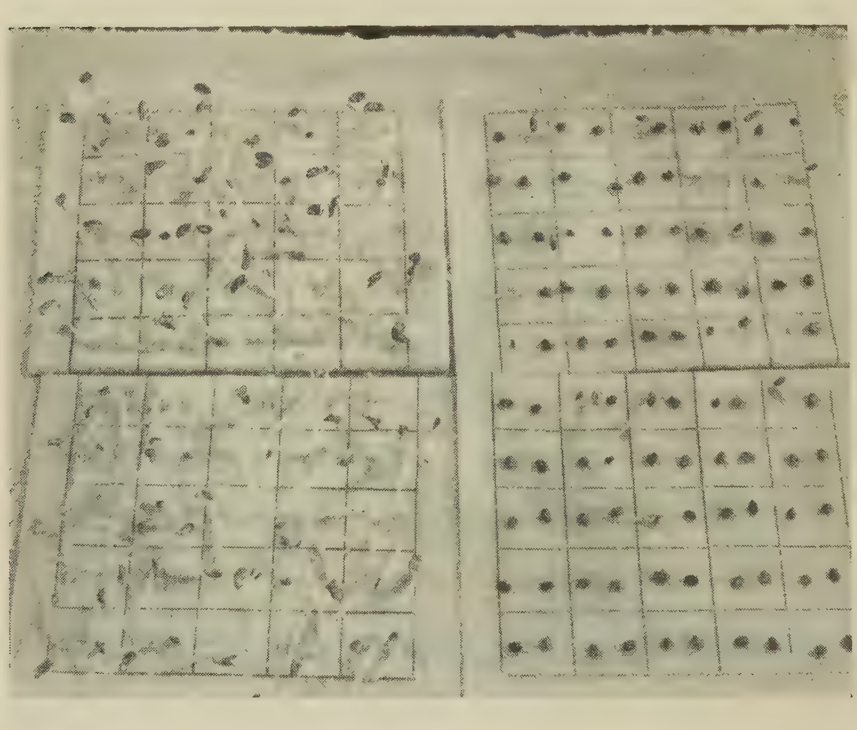
Standards of Quality

The quality of seed is defined by three factors, its purity, its germination, and its strain.

↓ Portion of the seed-testing laboratory. All routine laboratory duties are carried out by young women, who find the work full of interest. Staff is usually recruited from girls of school-leaving age with education at least up to School Certificate standard. Watt photograph.

A seed sample being analysed for purity.

▼Red clover seeds of high (left) and low (right) germination. Before germination these samples were very similar in appearance.



Purity

Good seed is of high purity; that is, it does not contain large quantities of unwanted or possibly harmful weed seeds which, if sown, might ruin the resultant crop. Practically all samples contain some weed seeds, and the buyer must decide whether those in the line offered are likely to be a menace in the conditions under which the seed will be sown. Other crop seeds are usually viewed with tolerance, but one exception is perennial ryegrass seed as an impurity in cocksfoot seed intended to be sown for further seed production; if appreciable proportions are present, the ryegrass tends to dominate the cocksfoot in a seeding stand. Inert matter, though harmless, is valueless, and unduly large amounts of broken seed, dirt, and chaffy material can affect adversely the true value of the seed.

A purity analysis is made by inspection. When a sample from a line of seed is submitted for examination a small working sample is taken in such a way as to be representative of the seed submitted. From this sample are separated all other crop seeds, weed seeds, and inert matter, and their description is recorded. All these separations are weighed carefully on a precision balance, and the pure seed content is calculated as a percentage of the sum of all the separations. Thus, a purity of 98 per cent. means that in every 100 lb. of the line 98 lb. is pure seed.

The certificate issued by the Seed-testing Station records the percentages of each separation present in the sample, and also lists, in approximate order of the amount present, the botanical names of the weed seed and other crop seed impurities observed during the analysis. Botanical rather than common plant names are used on certificates to avoid the confusion which exists in common plant names. Many examples could be quoted of the same common name being applied to widely different species and, conversely, of the one plant being known in different districts by different common names. The botanical name is also essential in sales overseas, where the divergence in application of common names is even greater.

Germination

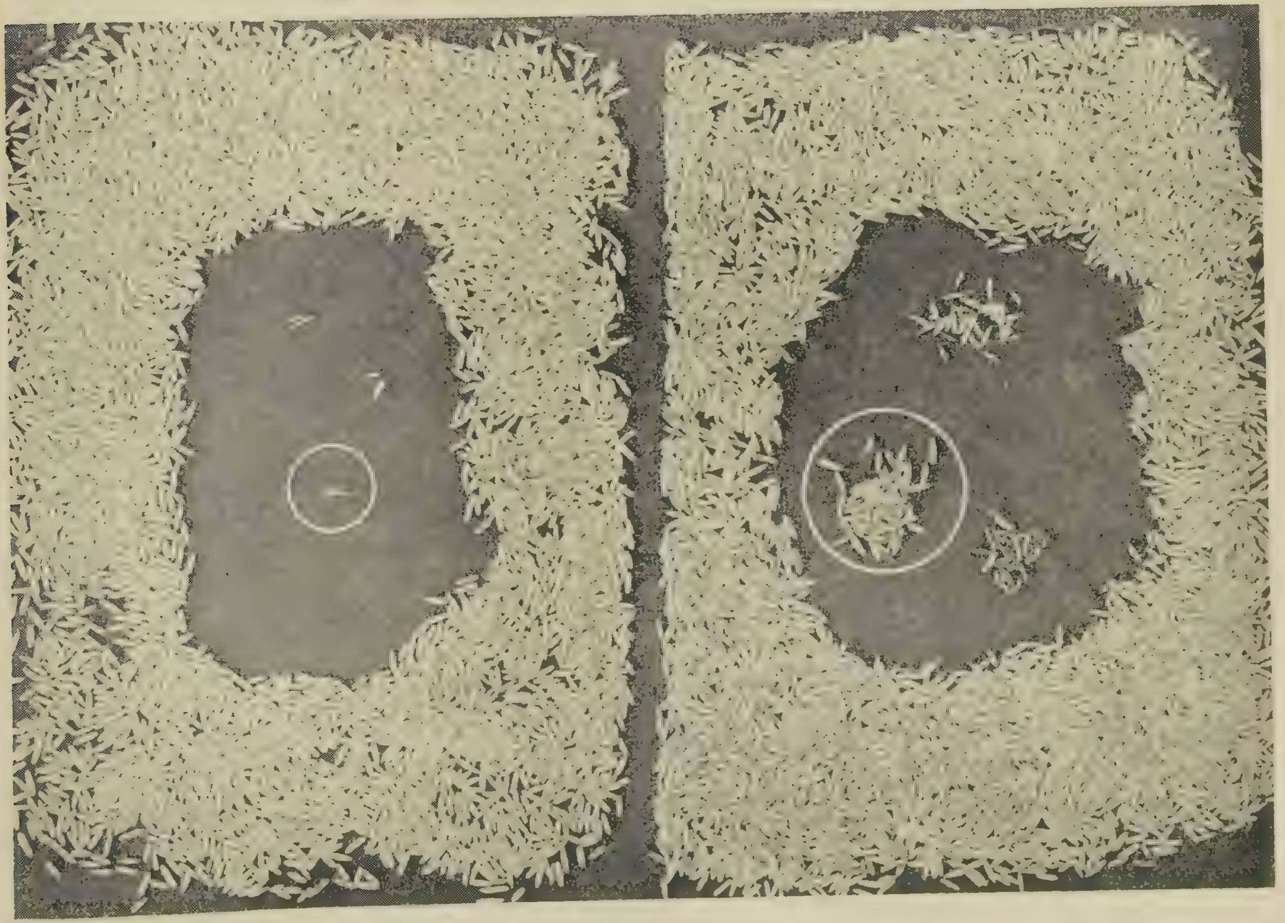
Pure seed has no value unless it will grow and produce healthy, mature plants. In testing for germination it is not possible to grow the seed to maturity under field conditions and estimate the percentage of plants produced. Under laboratory testing some 400 pure seeds are placed on damp, absorbent paper in a germinator cabinet at the most suitable temperature for rapid germination. After a number of days, fixed for each variety under test, the tests are examined and seedlings which to the trained eye of the analyst appear capable of continued growth are counted and removed. Later the seeds are again inspected and any further healthy seedlings removed.

The length of time between counts varies with the species. At least two counts are always made and sometimes as many as four are necessary. However, only two are reported—an early or interim count and a final count at the conclusion of the test. The interim report gives the speed of germination and is an indication of the seed's vitality; the final count defines the total percentage of viable seed.

When the results of a germination test are reported certain additional information is given. Hard seeds are found in varying quantities in legumes. These seeds are normal in that they are alive, but they have a very tough seed coat, and germination is delayed until water can penetrate it. Unless

Ryegrass seedlings undergoing the ultra-violet light test for determination of type.

▼ The impurities in perennial ryegrass samples with a purity of 99.8 per cent (left) and 92.6 per cent (right). In each sample the circle encloses the weed seeds present. Watt photograph.



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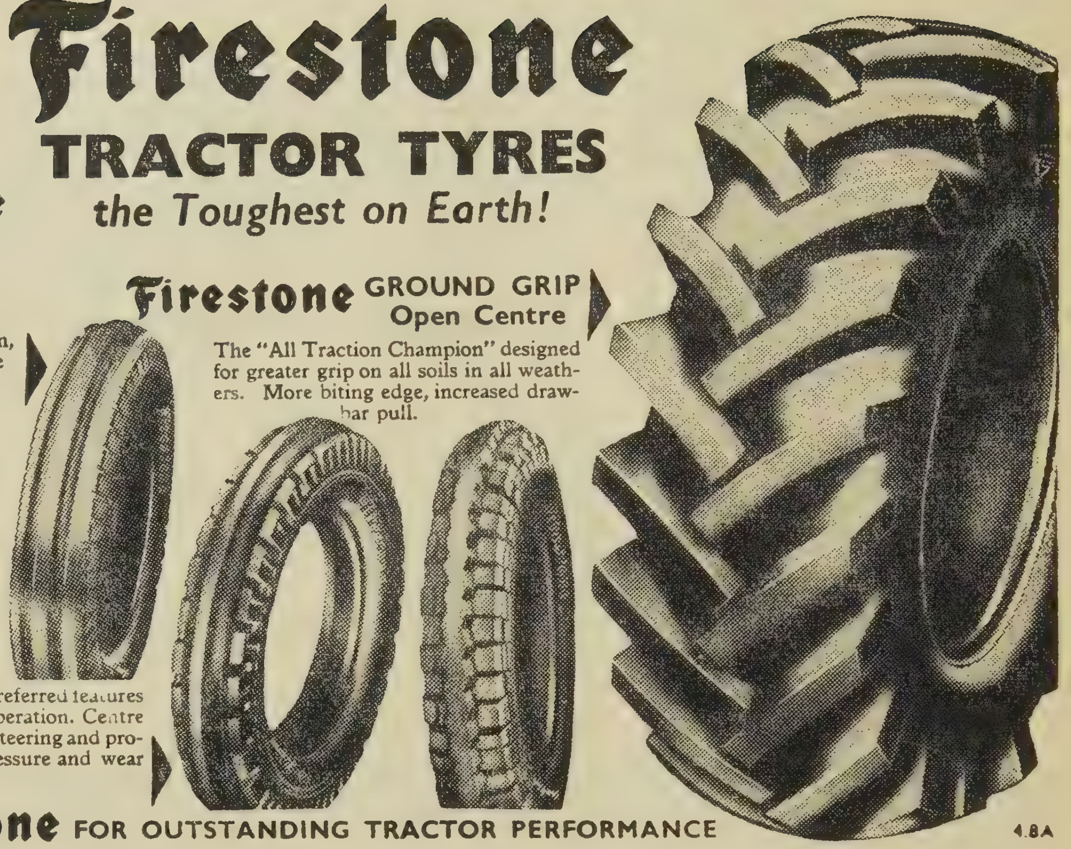

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they are present in very large numbers, they are usually regarded as normally germinating seeds, as after a comparatively short period in the soil most of them will grow.

In the laboratory a seedling is regarded as normal if it produces those parts essential for its continued growth and the development of a mature plant. Sometimes the seedling will produce a root which shows distinct fractures or a sprout without any seed leaves. Such damage is usually caused by mechanical injury to the embryo within the seed. These seedlings would never reach a healthy maturity and are classified as abnormal growths.

Generally samples show comparatively few of these abnormal growths, but under certain conditions there may be a very large increase in the proportion of them. Legumes are the worst offenders in this respect and on occasions lupin seed has been so damaged as to produce far more abnormal than normal seedlings. Red clover usually shows far more abnormal growths under germination test than does white clover. If the proportion of broken or damaged seed in a sample is high, it can be assumed that abnormals will also be found among the germinating seedlings.

By considering the results of both the purity and the germination analyses together the buyer can estimate what percentage of the seed he buys is pure living seed and thus arrive at an estimate of its true worth. If the analysis shows a purity of 98 per cent, 98 lb. in every 100 lb. is pure seed. If this pure seed has a germination of 90 per cent, 90 per cent of the 98 lb. or 88.2 lb. in every 100 lb. of the seed (88.2 per cent) is pure living seed.

The value of seed cannot be estimated from either purity or germination alone. Two lines may have the same purity—say, 98 per cent—but the germination of the first may be 90 per cent and of the second 60 per cent. A comparison of value is then 90 per cent of 98 to 60 per cent of 98, or 88.2 to 58.8.

The percentages of seeds germinating at the interim and the final stages of counting are recorded on the certificate with the percentages of hard seeds and abnormal growths. The calculated percentage of pure living seed in the sample completes the information supplied.

All seed certified under the New Zealand Department of Agriculture's certification scheme is sampled independently by Departmental officers and tested for purity and germination at the Seed-testing Station.

Strains

Much seed is tested for strain or type by plot testing. This involves the growing of the seed under field conditions, observing it during its growing period, and classifying it according to the results of these inspections. The Seed-testing Station is unable to undertake such work, but it has developed laboratory tests for the identification of strain in two of New Zealand's most important species, perennial ryegrass and white clover, and carries out routine tests of this nature in association with the certification scheme.

For identifying the seed of true perennial ryegrass the ultra-violet light test is used. The seed is grown on moist filter paper and observed under a screened mercury-vapour lamp. Short-lived strains produce on the paper a substance which glows under the ultra-violet light rays; true New Zealand perennial ryegrass does not do this

The other laboratory test, the picric acid test for white clover, depends on the fact that the better strains of white clover contain greater quantities of certain glucosides than do the poorer strains. These glucosides break down when the plant tissue is crushed, liberating small quantities of hydrocyanic acid gas. This gas can be detected when it comes in contact with paper which has been soaked in picric acid. Normally the paper is bright yellow, but contact with hydrocyanic acid causes it to turn brown. Thus, with pure lines of the best strains of seed the paper turns a dark, reddish brown, while with the poorest strains there is little or no change in the colour of the paper. With these methods the standard of the strain can be assessed in about 10 days instead of the many months necessary when the plot test method is used.

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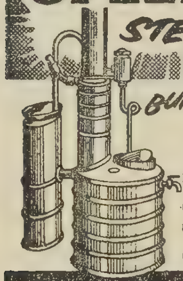

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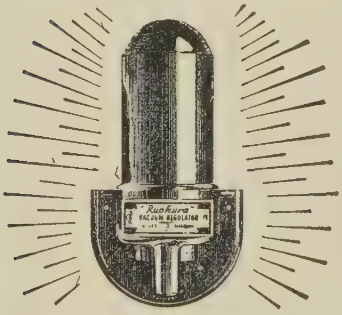

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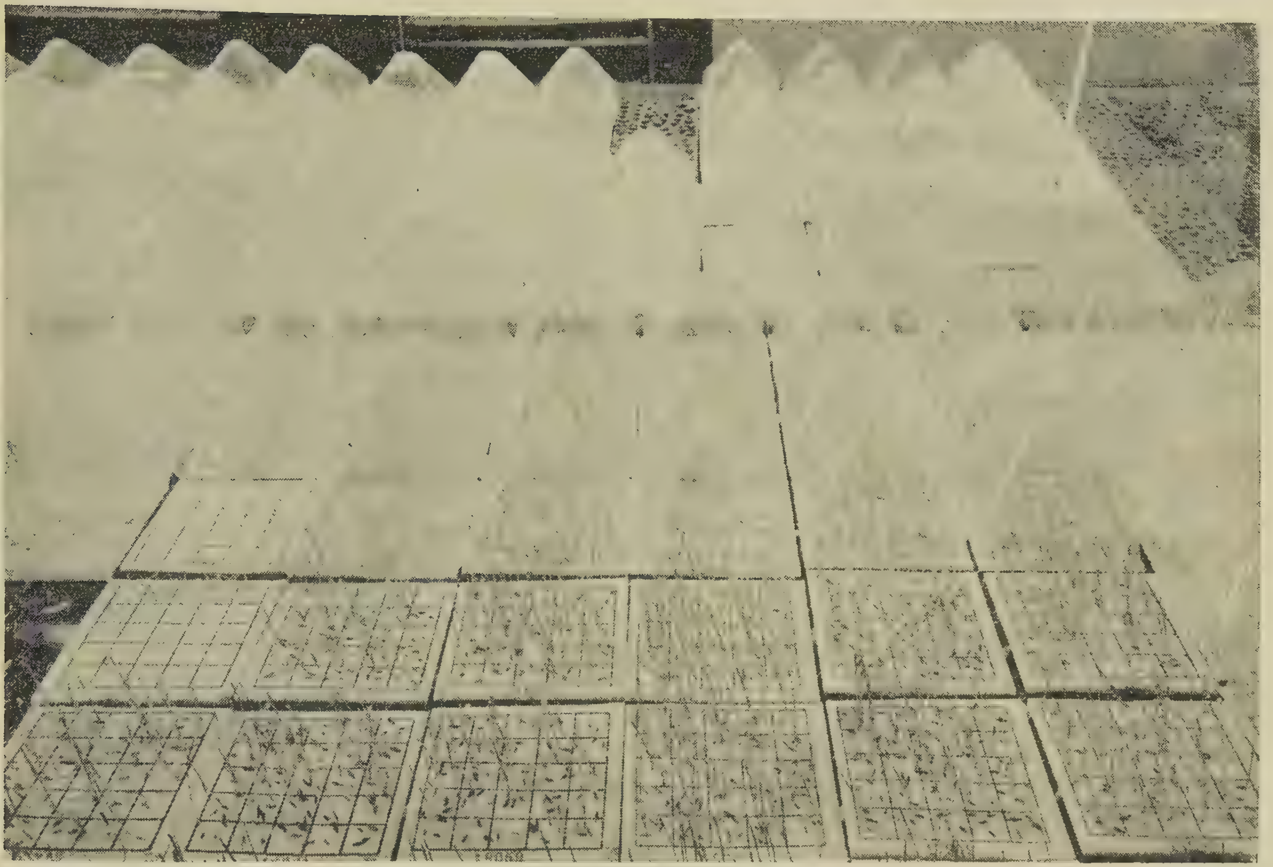

[Watt

Seed samples are germinated on thick paper under moist conditions to measure the viability of the samples.

Moisture Tests

When seed is to be shipped or stored it is desirable that its moisture content be known. If the seed contains too much moisture, it will deteriorate very rapidly and germinate unsatisfactorily.

Chewings fescue, crested dogstail, peas, wheat, and barley are the principal seeds submitted for testing of moisture content. In addition, the Station acts for the Wheat Research Institute and carries out pre-harvest moisture tests on wheat samples from North Island growers.

Blind Seed Disease in Ryegrass

During December and January each year a sub-station is established at the offices of the Department of Agriculture at Timaru for the pre-harvest examination of ryegrass for blind seed disease. In some seasons over 3,000 samples are submitted for examination. Samples taken from crops before they are harvested are examined and the degree of infestation by blind seed disease estimated.

This service enables the grower to spare himself the labour and expense of harvesting crops which have been so seriously damaged by the disease that they are capable of producing only seed of low germination.

Special Service for Farmers

A free advisory service is provided for farmers desiring information on any particular line of seed, and is availed of mostly in respect of seed for which purity and germination certificates are not available. A sample of this nature forwarded to the Seed-testing Station is reported on by letter, as the information so supplied is regarded as of an advisory nature only and not as a basis for trading.

General Service for Merchants and Farmers

The major service provided is the testing of samples to provide certificates which serve as a basis for trading both within New Zealand and overseas. Demands for internal trading are usually satisfied by the ordinary purity and germination certificates, but the export trade often requires more detailed tests.

Special searches may be made to ensure that the samples submitted are free from dodder; seed for export to Australia must comply with the Australian Quarantine Act; for the Canadian buyer all lines must be covered by certificates which record the grade of seed in accordance with the regulations of that country; the United States of America lays down certain conditions with which seed must comply before it can be imported. Tests for all these purposes are carried out and certificates issued.

Each week during the year about 1,000 samples come to the Station for test, including seeds of all kinds—flowers, vegetables, trees, cereals, clovers, and grasses. With a growing conception of the variation in values between different lines, pride of place must go to the better seed. These values can be determined only by accurate testing, and the certificates covering these tests must have the confidence of merchants not only in New Zealand but also overseas. The value to the seed trade of a service such as that given by the Seed-testing Station is indisputable.

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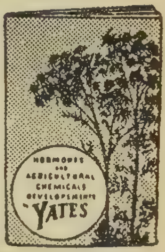

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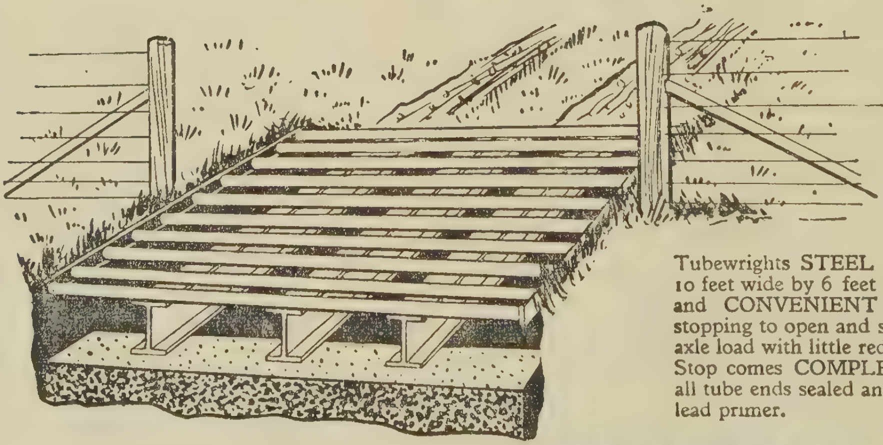

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Planning Winter Feed for the Dairy Herd

THE importance of wintering cows well for them to produce well has been stressed at all Farmers' Conference Weeks at Ruakura to date. At this year's conference J. D. J. Scott, Instructor in Agriculture, Department of Agriculture's Animal Research Station, Hamilton, reiterated why cattle must be wintered well and gave details of how much supplementary feed was needed at Ruakura to winter the cows satisfactorily, about 5,000 cows having been wintered there in the last 13 years.

THE result of experiments conducted at Ruakura Animal Research Station and Massey College has shown that cows which are wintered poorly and are very thin at calving cannot produce to their maximum the following lactation, no matter how well they are fed, and that their output in extreme cases can be reduced by 50 lb. or more of butterfat. Furthermore, the production of cows which are underfed for the first 6 to 8 weeks after calving is depressed not only during this preiod, but also throughout the remainder of lactation, when feed is in ample supply.

At last year's conference Dr C. P. McMeekan described the results obtained from the No. 2 Dairy experiment at Ruakura, in which controlled and uncontrolled grazing were compared, and in which quite different quantities of hay and silage were fed to each herd during the winter. Because it is reasonable to assume that most of the increased production of the controlled grazed herd was due to the better way in which it was wintered and because this herd, complete with replacements, was run on a self-contained basis under typical commercial conditions for 13 years, the recommendations for the supplementary feed requirements of dairy cattle are based on the quantities conserved and fed to this controlled grazed herd.

Supplementary Feed Required

Over a period of years ½ acre of silage and hay per cow was provided for the complete yearly requirements of this herd and its young stock. Of this total quantity almost two-thirds was conserved as silage and one-third as hay.

Of the total feed saved 80 per cent was used during autumn and winter for feeding all the in-calf cattle and the remainder for the yearlings in winter and to sustain milk production in summer. In other words about one-third acre or 1 ton of silage and 8 bales of hay were provided for each cow and rising 2-year-old during winter and an additional 8 bales of hay was consumed by each yearling during its first 20 months of life.

Even with these quantities of conserved feed, it is not possible to winter cattle satisfactorily without making a deliberate attempt to save some autumn-grown pasture. On this controlled-grazed farm an average of 35 per cent of the farm area was closed during autumn for use in late winter This amounted to almost ½ acre of autumn-saved pasture per cow.

Varying Conditions

The quantities mentioned apply only to conditions similar to those at Ruakura, there is a very marked variation in the quantities required from year to year, and on all farms the quantities of conserved feed needed depend on the supply of alternative feed available. The most common alternative feed on hand is pasture and the supply of this in winter is governed by many factors such as climatic conditions, soil conditions, winter-growing ability of the pasture species present, stocking rate, and grazing management. Therefore, when the quantities mentioned are considered, allowances should be made for variations between local conditions and those at Ruakura. As a further guide to calculating how much winter feed is required, it has been shown that a dry pregnant Jersey will maintain condition on 12 to 15 lb. of hay or 60 to 70 lb. of silage per day.

Effect of Improved Winter Feeding of Cows on National Production

IF all the hay and silage conserved annually throughout New Zealand were used for feeding our dairy cattle alone, only just sufficient would be provided for their winter needs at the level of feeding Ruakura has found desirable; that is, one-third acre per cow. There is little doubt, therefore, that on a national basis a marked increase in total butterfat production would immediately follow an improvement in the level of winter feeding of our dairy cows.

There are four main points with these figures for the supplementary feed requirements of dairy cattle which are worth stressing:

(a) The quantities quoted are for average requirements, and these amounts of hay and silage can be grown and conserved with relative ease on the vast majority of North Island dairy farms.

(b) They can be used to compare your own production results with those at Ruakura. If your cows are receiving much less hay and silage than those at Ruakura, production would almost certainly increase if the level of feeding in winter was stepped up. If they are as well fed as Ruakura's and output is still low, other aspects of management will need attention.

(c) They can be used to help solve some of the managemental problems which arise throughout the year. For instance, in a year when supplies are low the herd can be dried off earlier and large quantities of autumn pasture saved. If winter feed is consistently scarce, calving could well be delayed. In years when there are plentiful supplies, the herd can be milked right on in autumn. In spring, too, it is particularly useful to bear in mind a figure for normal requirements in case too many paddocks are shut up for silage and hay and the herd is penalised.

(d) They can be used to help plan farm expenditure. In these times when it is essential to obtain the fullest possible return from invested capital every care should be taken to ensure that the money spent on feeding the herd is well repaid, because the greatest proportion by far of farm expenditure is invested for the purpose of growing and utilising feed. If, then, little difficulty is experienced in providing sufficient supplementary feed for the needs of the herd, I can see little point in trying to grow more feed by cropping and pasture renovation, draining, or heavy fertilising unless the extra feed grown is likely to be put to good use. In such cases expenditure on piggeries, herd improvement, or milking equipment might pay much greater dividends. If, on the other hand, there is often difficulty in obtaining sufficient surplus in spring, the wisest course may be to attempt to grow more feed rather than concentrate on some other project. Each farm, of course, must be treated individually when making such decisions.

Subtropical Fruit Production and Planting Trends

By W. A. FLETCHER,
Citriculturist,
Department of Agriculture,
Auckland

THE subtropical fruit industry in New Zealand is somewhat unique in that its main development has been with two fruits that are not grown commercially elsewhere in the world. These fruits are the tree tomato (*Cyphomandra betacea*), which is a native of Brazil and Peru in South America, and the Chinese gooseberry (*Actinidia chinensis*), which comes from the Yangtse Valley in China. Passion fruit (*Passiflora edulis*) and feijoa (*Feijoa sellowiana*), both from South America, are the other subtropical fruits at present grown commercially in New Zealand.

[*Sydenham*

Numbers of Chinese gooseberry vines in commercial production have so increased in recent years that within 5 years supplies for marketing could almost double to a total of about 400 tons a year.

MANY other subtropical fruits, including avocados, bananas, cherimoyas, figs, guavas, loquats, litchis, mountain pawpaws, olives, and macadamia nuts, have also been introduced into New Zealand, but only the avocado and macadamia nut show any commercial promise at present. In recent years a commercial orchard of avocados has been developed at Gisborne.

The table below shows the number of plants, approximate acreages, and estimated commercial production of subtropical fruits in the various districts in 1957.

Despite heavy frosts in June and July which caused some losses of fruit of Chinese gooseberries and tree tomatoes, especially at Auckland, production of subtropical fruits in 1957 was a record. Frost damage to subtropical fruit plants was not serious, but a few young tree tomato plants and passion vines were killed.

Planting Trends and Outlook

Young tree tomato plants and Chinese gooseberry vines were in short supply in 1957 and new plantings during the year were very much fewer than in the past few years. Nevertheless, there was an expansion in the area planted in these fruits. A 5 per cent increase in tree tomato plants and a 2½ per cent increase in Chinese gooseberry vines were recorded.

Tree Tomatoes

It was expected that the heavy production of tree tomatoes in 1957 would have depressed the market for these fruits, but demand seems to be keeping up with supply and market returns were satisfactory. Because of the high rate of plantings in the 2 years before 1957, yields of tree tomatoes should be maintained at more than 800 tons and with favourable weather may reach as high as 900 tons this year.

Despite the apparent increasing demand for tree tomatoes there is still a danger that expanding production of these fruits may result in the market being over-supplied at the peak of the season. Results of trials for canning tree tomatoes have been disappointing and export of surpluses does not hold much promise at present. Three tons of tree tomatoes sent to Australia in 1957 were not well received. Nevertheless small export shipments of these fruits are being continued this year.

Chinese Gooseberries

The numbers of Chinese gooseberry vines have increased by about 40 per cent in the last 4 years and production could almost double to a total of about 400 tons within the next 5 years or so. Despite rapidly increasing production, returns for these fruits were still good in 1957, but there were signs that too much fruit was reaching the market at the peak of the season. Three more cool stores were erected in 1957, primarily for holding Chinese gooseberries, and growers are resorting more and more to this method of spreading their marketing.

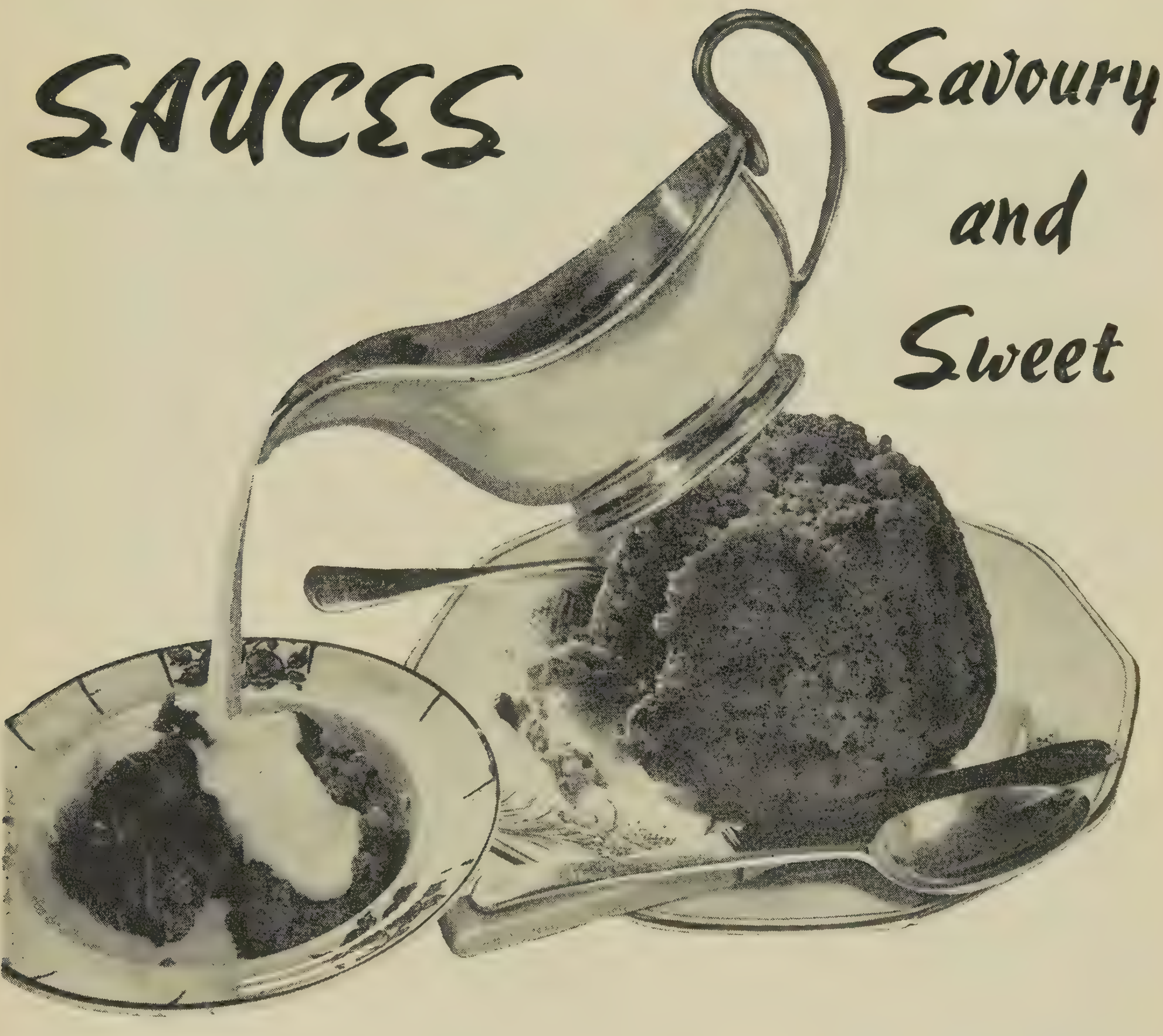
Export of Chinese gooseberries to Australia and the United Kingdom continues to show promise of absorbing excess supplies and 27 tons were shipped overseas in 1957. A similar quantity is to be exported again this year. In a storage trial with Chinese gooseberries last season polythene plastic case liners were highly effective in preserving the fruit and preventing shrivel and shrinkage. The experiment was so successful that all Chinese gooseberries exported this year will be packed in polythene-lined cases.

ESTIMATED ACREAGES* AND PRODUCTION IN TONS OF SUBTROPICAL FRUITS IN NEW ZEALAND DURING 1957

	Tree tomatoes			Chinese gooseberries			Passion fruit			Feijoas				
District	Plants	Acreage	Production (tons)	Plants	Acreage	Production (tons)	Plants	Acreage	Production (tons)	Plants	Acreage	Production (tons)	Approximate total acreage	Total production (tons)
Kerikeri ..	45,400	130	400	4,300	36	38	2,500	10	4	2,800	11	4	187	446
Auckland ..	16,300	47	100	2,200	18	30	2,000	8	4	1,900	8	6	81	140
Tauranga ..	28,700	82	180	4,500	37	120	4,400	17	25	3,500	14	14	150	339
Te Puke ..	23,000	66	140	4,700	39	90	6,400	26	60	700	3	1	134	291
Totals ..	113,400	325	820	15,700	130	278	15,300	61	93	8,900	36	25	552	1,216

* Acreages based on 350 tree tomato, 250 feijoa and passion fruit, and 120 Chinese gooseberry plants per acre.

SAUCES Savoury and Sweet



By CHRISTINE LYONS,

formerly Home Science Instructor, Department of Agriculture, Auckland

THOUGH sauces can do much to enhance food, they are neglected by many people. The French have always realised their importance, and it is said that the French have a hundred sauces and one religion, while the English-speaking countries have a hundred religions and one sauce. However, there is no doubt that this knowledge of sauces has contributed greatly to the French reputation for excellent cooking and has proved that a little time and trouble spent in the making of a sauce is definitely worth while.

SAUCE making offers scope for individuality. The perfect sauce should be of good consistency, suitably flavoured, smooth, and glossy. Because sauces are accompaniments, amounts needed are not large, and about 2 tablespoons per person is adequate.

Sauces should not be considered as last-minute accessories. Most can be prepared well in advance and can be kept warm in a double boiler, but the water in the bottom of the boiler should not be boiling. To prevent a skin from forming on the sauce place a few tiny pieces of butter on top of the cooked mixture.

The flavour of many sauces is improved with lengthy cooking and this may mean considerable evaporation of the liquid, but further liquid may be added before serving to obtain the correct consistency.

Wine is used frequently in sauce making. It should not be added to the sauce just before serving, as the resulting flavour may be bitter. The usual procedure is to reduce the quantity of wine during cooking as in the Madeira sauce recipe given on page 489.

For sauces thickened with eggs or egg yolks cooking over water in a double boiler will ensure that they will not boil. Should the sauce show a tendency to curdle, add ½ teaspoon of cold water and beat vigorously until smooth. If the sauce requires both eggs and a starchy thickening, such as cornflour, cook the starch with the

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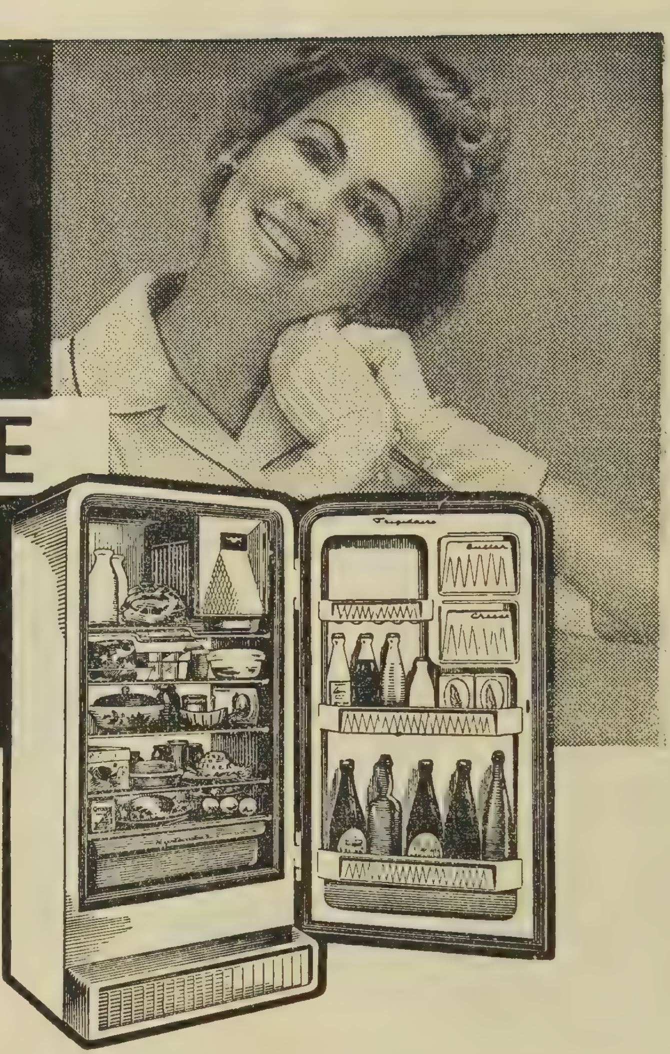

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liquid first and then remove from the heat and cool slightly before adding the beaten egg.

Some savoury sauces are made with a base of flour that has been gently cooked in fat (roux base). The roux will acquire different degrees of colour, depending on the length of cooking time. The fat is melted slowly, and then the flour is added and stirred until the mixture is smooth and, for a white sauce, cooked gently for 1 to 2 minutes. The heated liquid is stirred into the other ingredients after the pot has been removed from the stove.

Sauces (and foods generally) could be made considerably more interesting and varied by judicious use of herbs and spices. Try experimenting with different flavours and keep stocks of the following ingredients in the cupboards: garlic—a little used in all types of savoury dishes greatly enhances the flavour, but remember that a little goes a long way; ground mace—excellent for use in fish cookery; mixed herbs—for savoury sauces and stuffing; bayleaves—for bouquet garni, stews, and soups; and cloves and peppercorns.

Savoury Sauces

Bechamel Sauce

Bechamel is the French name for a creamy white sauce with a roux base. Flour mixed with milk or water (very often with lumpy results) is not a bechamel sauce, and though a little more work is required to make this sauce, it should not be scorned because of this.

1 small carrot
Small pieces of celery (if available)
½ small onion
A few mushroom peelings or dried mushrooms
6 peppercorns
2 cloves
½ pint of milk
1 oz. of flour
1 oz. of butter
½ teaspoon of salt
Pepper
1 tablespoon of cream

(6 servings)

Cut the vegetables into small pieces and put these into a saucepan with the milk, peppercorns, and cloves. Leave to infuse over a low heat for 10 to 15 minutes and then strain. Melt the butter in another saucepan, add the flour, salt, and pepper and cook gently for 1 to 2 minutes, remove from the heat, then slowly stir in the hot, seasoned milk.

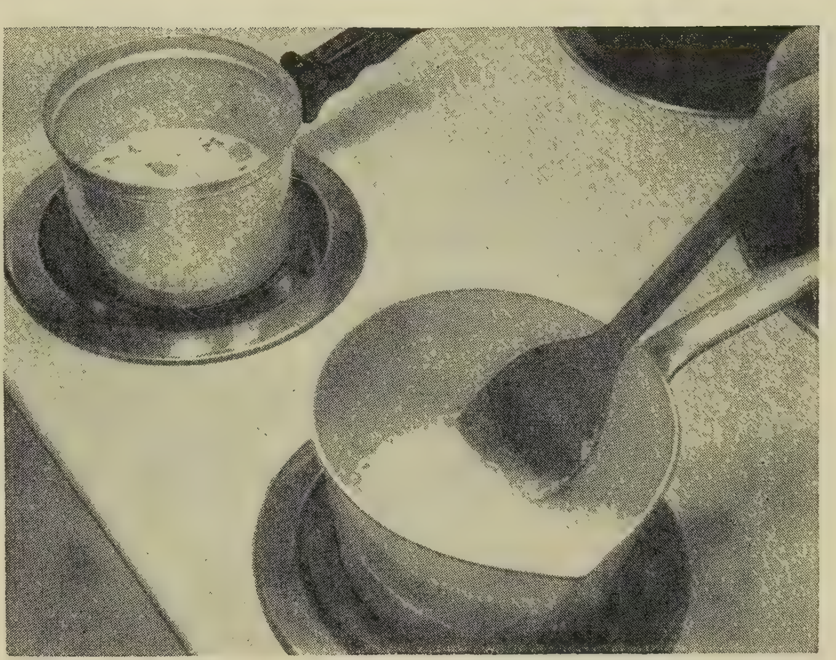
Return to the heat and stir until boiling and then allow to simmer for 2 to 3 minutes. Add the cream just before serving.

Onion Sauce

Combine equal parts of bechamel sauce with equal parts of onion puree and add 1 to 2 tablespoons of cream before serving. Season well and serve with braised lamb or sausages.

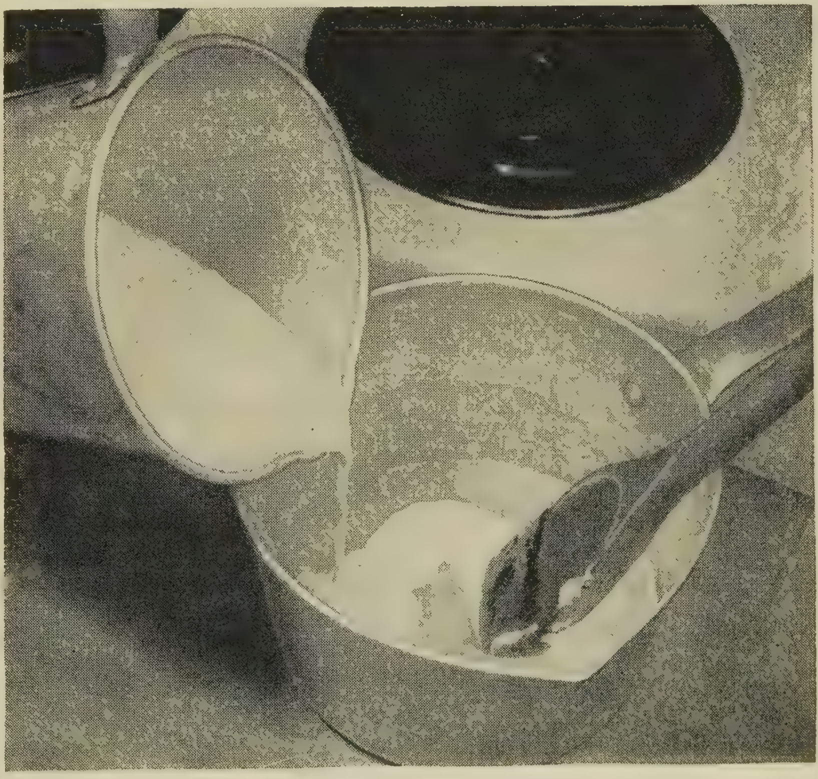
Cheese Sauce

Add 1 to 2 oz. of finely grated tasty cheese to the bechamel sauce described above when it is hot. Do not reheat



Making a roux base sauce: Infusing the milk and gently cooking the butter and flour.

▼ Adding the strained heated milk to the butter and flour mixture after the latter has been removed from the heat.



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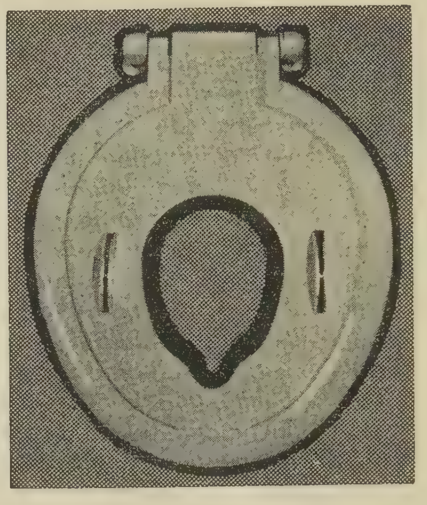

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the sauce once the cheese has been added. Serve with fish or hard-boiled eggs.

Madeira Sauce

1 oz. of fat
1 oz. of flour
1 dessertspoon of tomato puree
½ pint of stock
3 tablespoons of Madeira wine
½ tablespoon of stock
1 dessertspoon of butter
⅛ teaspoon of salt
Pepper

(6 servings)

Melt the fat, add the flour, salt, and pepper, and cook very slowly until brown. Remove from the heat and add the ½ pint of stock and the tomato puree. Bring to the boil, stirring continuously, and leave to simmer for 10 to 15 minutes. Meanwhile, put the Madeira wine and the ½ tablespoon of stock into a small saucepan and cook until the quantity is reduced to half. Then combine with the other mixture and boil gently for a few minutes. Remove from the heat, add the butter, and season further if necessary. Serve with boiled bacon or gammon.

Sauce Paysanne

3 tablespoons of cooking oil or 1½ tablespoons of fat
1 medium-size onion
1 small clove of garlic
¼ teaspoon of salt
Pepper
2 tomatoes or 2 tablespoons of tomato puree
3 tablespoons of vinegar
2 tablespoons of brown sugar
½ cup of water or stock
1 dessertspoon of chopped parsley and mint

(4 to 6 servings)

Fry the chopped onion and finely chopped garlic in the fat or oil until golden brown. Then add the sliced tomatoes or puree and cook for 3 to 4 minutes. Add the brown sugar, vinegar, and water and leave to simmer for 10 minutes. Season to taste and just before serving add the parsley and mint. Serve with grilled chops.

Piquant Sauce for Grills

1½ oz. of butter
1 clove of garlic crushed with ⅛ teaspoon of salt
4 tablespoons of tomato pulp
Pinch of nutmeg
1½ teaspoons of prepared mustard
1 teaspoon of sugar
Pinch of cayenne pepper
¼ teaspoon of grated lemon rind

(4 servings)

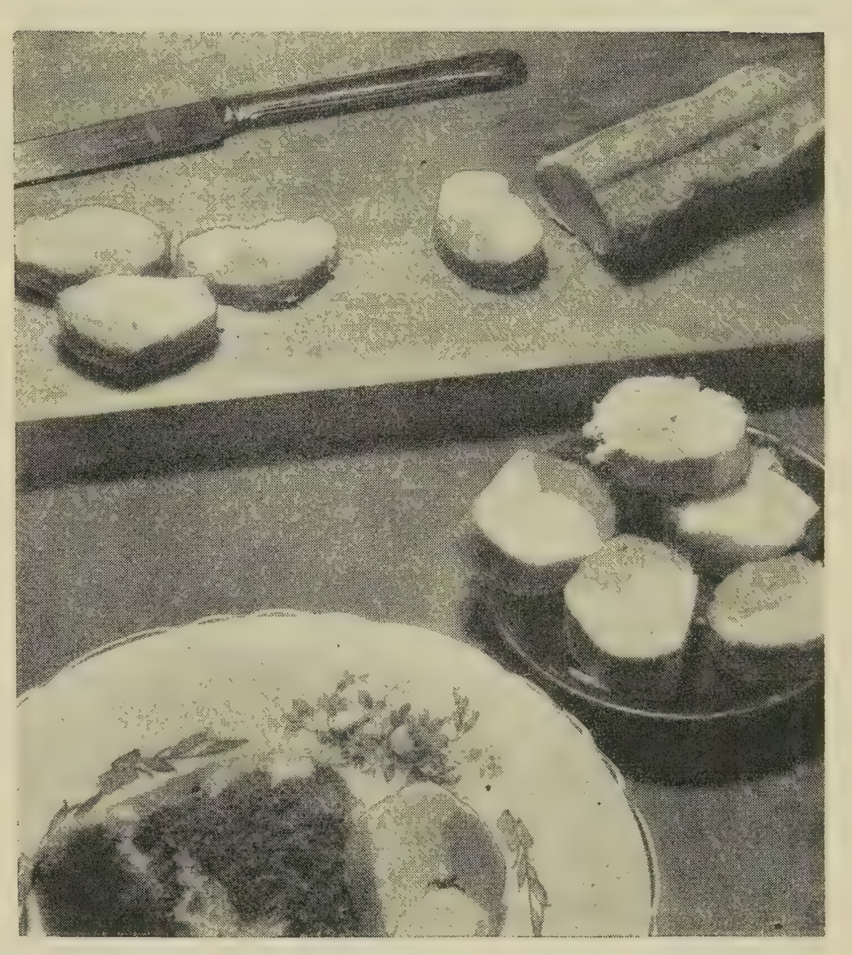
Melt the butter and add the garlic and salt. Cook until slightly brown, add the remaining ingredients, and simmer until thick. Serve with steaks or mixed grills.

Mushroom Sauce

1 oz. of butter
1 small onion
2 tablespoons of chopped mushrooms (dried or fresh)
¾ oz. of flour
⅛ teaspoon of mace
8 oz. of stock
2 tablespoons of cream or top milk
Salt and pepper

(4 to 6 servings)

Soak the mushrooms if dried. Melt the butter, add the onion and chopped mushrooms, and cook lightly for 4 to 5 minutes. Then add the flour, mace, and salt and pepper and cook gently for 1 to 2 minutes. Remove from the heat, stir in the stock, then bring back to the boil and simmer for a further 3 to 4 minutes. Add the cream and further seasoning if necessary just before serving. Serve the sauce with fish or rabbit or bake raw fillets in it.


Harlequin hard sauce is good with steamed or baked pudding.

Sweet Sauces

Some of the recipes for sweet sauces given here may seem very rich and perhaps extravagant. However, only small amounts are needed for each serving.

Tutti-fruiti

1 tablespoon of butter
2 oz. of peeled, pipped grapes or 2 oz. of Chinese gooseberries
1 dessertspoon of almonds, finely chopped
½ an apple, diced
½ a medium banana, diced
1 dessertspoon of chopped glace cherries
1 dessertspoon of lemon juice
¼ teaspoon of grated lemon rind
Sugar to taste (about 2 teaspoons)
2 to 3 dessertspoons of brandy

(4 to 5 servings)

Melt the butter, add the fruit, and cook quickly for 3 to 4 minutes; then add the lemon juice, rind, sugar, and finally the brandy. Simmer for 5 to 10 minutes and serve hot with ice cream.

Butterscotch Sauce

2 tablespoons of golden syrup
1 tablespoon of brown sugar
¼ oz. of butter
Juice of ½ a lemon
¼ pint of water
1 teaspoon of custard powder
1 to 2 tablespoons of chopped walnuts

(4 to 6 servings)

Put the syrup, sugar, and butter in a pan and cook gently until brown, add the water and bring to the boil. Mix the custard powder with a little water and stir slowly into the above mixture. Reboil, then add the lemon juice and chopped walnuts. Serve with ice cream or baked apples.

Mousseline Sauce

Mousseline sauce is a delicately flavoured, custard-type sauce that is ideal for serving with steamed puddings.

1½ oz. of sugar
2 egg yolks
1 egg white
2½ oz. of cream
2 tablespoons of sherry

(4 to 6 servings)

(Continued at foot of page 490)

Adapting Recipes for Use in New Zealand

VERY often when the housewife is inspired to greater cooking heights by the wonderful illustrations accompanying the recipes in many of the overseas magazines she finds on reading further that the ingredients listed are either not obtainable in this country or are available in a form slightly different from that called for. Unfamiliar measures, too, will often dissuade the busy housewife from trying a new recipe if she is unable to reconcile the measures given with those she knows.

By JUDITH FERRIER,
Home Science Instructor,
Department of Agriculture,
Christchurch

THE following list should prove helpful to those who enjoy experimenting with new and different dishes and housewives who would be more venturesome in the culinary art if they could predict results with some degree of certainty.

Measures

The standard measuring cup used in New Zealand is 8 fl. oz. However, most of the measuring cups available here are 10 fl. oz. cups with the 8 oz. mark **below the 1 cup line.**

The American cup = 8 fl. oz.
The American pint = 16 fl. oz.
The British imperial pint = 20 fl. oz. This is the measure used in New Zealand.

2½ 8 oz. cups = 1 imperial pint.
1 gill (a measure frequently used in British recipes) = ¼ imperial pint.

Ingredients

1 yeast cake (U.S.) = ½ oz. compressed yeast (1 tablespoon).

1 yeast cake (N.Z.) =1 to 1¼ oz.

1 envelope of gelatine (U.S.) = 1 tablespoon.

1 envelope of gelatine (N.Z.) = 2 dessertspoons.

1 square of chocolate = 1 oz. of chocolate.

1 cup of cake or pastry flour = ⅞ cup of New Zealand flour.

Enriched flour: No changes need be made where this is indicated, as the enrichment affects only the nutritive value of the flour and does not alter its baking qualities.

Substitution of Ingredients

Corn syrup: This will be used in either of two ways. (1) As a sweetening in cakes, biscuits, and sauces. Use as a substitute golden syrup diluted by half or more with water to make up the required amount. (2) As an acid ingredient in making sweets of the crystalline type (fondant and fudge) to ensure the formation of tiny crystals. For this purpose ⅛ teaspoon cream of tartar can replace 1 tablespoon of corn syrup.

Graham flour: Wholemeal flour may replace this.

Graham crackers: Wheatmeal biscuits are suitable.

Sour milk or cream: This is often specified and can be obtained from fresh milk or cream by standing it in a warm place until it turns. If it is needed in a hurry, it may be soured by the addition of 1 tablespoon of lemon juice or 2 teaspoons of white vinegar to 1 cup of milk or cream. The latter method only is satisfactory for souring pasteurised milk or cream. Keep the milk in a warm place if it has just been taken from a refrigerator.

Chocolate: 1 square (1 oz.) can be replaced by cocoa if necessary, though the result will not be quite as good. To 3 tablespoons of cocoa add 1 tablespoon of butter and blend.

Evaporated milk: This is obtainable in New Zealand, but unsweetened condensed or concentrated milk will substitute adequately.

Sizes of Cans (American)

Size of can	Approximate weight or measure	Approximate cup measure
No. 1 picnic	10½ oz.	1¼ cups
No. 1 tall	1 lb.	2 cups
No. 2	1¼ lb. or 1 pint 2 fl. oz.	2½ cups
No. 2½	1 lb. 13 oz.	5 cups
No. 3 cylinder	3 lb. 3 oz. or 1 quart 14 fl. oz.	5¾ cups

Sauces Savoury and Sweet

(Continued from previous page)

Place all the ingredients together in a double boiler and whisk over gentle heat until the mixture is creamy, for about 10 minutes. Serve as soon as possible.

Sauces for Ice Cream

Jam Sauce

Apricot, strawberry, blackberry, raspberry, red currant, black currant, or satsuma plum jam may be used.

Use 1 tablespoon of jam per person and the juice of 1 lemon to every 4 tablespoons of jam.

Heat the jam gently in a small saucepan. If the jam is thick, add a little water. Stir in the lemon juice. Pour the hot sauce over plain ice cream and serve immediately.

Orange Sauce

Juice of 4 oranges
Juice of 1 lemon
3 tablespoons of sugar
1 tablespoon of cornflour

Heat the orange and lemon juice with the sugar. When the sugar has dissolved and the juice is hot thicken it with the cornflour (previously mixed to a smooth paste with a little cold water). If the sauce seems too thick, add a little boiling water.

Passion-fruit pulp or coconut milk may be added to the fruit juices to vary the flavour.

Serve the hot sauce with plain, chocolate, or coffee ice cream.

Hard Sauces

Hard sauces are a good accompaniment for steamed or baked puddings. They are mixed and then left in the refrigerator to chill. The brandy butter recipe makes a sauce particularly good for Christmas pudding.

Brandy Butter

3 oz. of butter
3 oz. of castor sugar
2 to 3 tablespoons of brandy

(4 to 6 servings)

Cream the butter until white and then gradually beat in the sugar. Add the brandy, a few drops at a time, sufficient to flavour but not to let the mixture curdle. If this should happen, beat in a little icing sugar. Pile the sauce on to a dish and leave in the refrigerator to harden.

Harlequin Hard Sauce

3 oz. of butter
6 oz. of icing sugar
Few drops of vanilla essence

(6 servings)

Cream the butter until white, then gradually beat in the icing sugar and finally the vanilla essence. For the harlequin effect divide the hard sauce into three parts. Leave one part plain and tint one part pink and the third part green. Join the pieces into a roll shape and leave in the refrigerator until hard. Cut into 1 in. slices when ready to serve.

Flavouring Essence

Fill an 8 oz. bottle with brandy and place a vanilla pod in this. Cork and leave untouched for 6 weeks, or longer if possible. Use a few drops as needed for flavouring for custards, icings, and cakes.

Photographs by Sparrow.

IRISES IN THE FLOWER GARDEN

THERE can be few flower gardeners who do not grow some irises, and though individual plants do not flower for very long, their season can be greatly extended by having various kinds flowering at different times. They are easily grown and require very little attention. In this article J. P. Salinger, Horticulturist, Department of Agriculture, Wellington, describes their culture in the flower garden. The notes on garden work for December are by Rosalie A. Campion, Horticultural Instructor, Department of Agriculture, Wellington.

[Elliott

Dutch irises provide excellent cut flowers in spring. They will grow in any good garden soil.

MANY gardens have just a few purple "flag iris" which are left in the same place for many years; however, like all plants they benefit from care and attention. As iris breeders both in New Zealand and overseas are producing many new and improved varieties, a wider selection of improved irises should be used in the garden.

Types of Iris

Garden irises can be separated into two large divisions—bulbous iris and rhizomatous iris—depending on whether the roots and top growth arise from a bulb or from a thick stem, a rhizome.

The culture of these two types is quite different, though nearly all irises can be grown in well cultivated soil. There are dwarf and tall species in both the bulbous and rhizomatous groups, and a combination of dwarf and tall plants either in a separate bed or in a mixed border can be made a feature in the garden at flowering time.

Bulbous Iris

Bulbous irises are one of the most useful cut flowers grown in the garden. The bulbs are cheap to buy, the plants are easy to grow, the flowers are excellent for decorative display in the house, and after flowering the ripening leaves can be easily hidden by other plants. As with other plants, pests and diseases must be controlled, but in general they require very little extra care or attention. The different types flower from mid winter to early summer, and by the planting of a selection of types and varieties, flowers may be gathered at almost any time during that period.

Life History of a Bulb

Bulbs are planted in late summer or early autumn. Immediately after planting, roots are formed from the base of the bulb; at the same time the leaves begin growing and the flower stalk and flowers start forming in the centre of the bulb. Leaves appear above-ground in autumn or winter; then the flower stalk grows out and flowering takes place. The flower stalk also has leaves attached to it. As the plants flower, the old bulb gradually dries up and new bulbs are formed underground at the base of the leaves within the outer brown scale leaves of the older bulb. By the time the flower stalk and leaves have dried off the new bulbs are mature, root initials have been formed at the bases of these bulbs, and the embryo flower stems and flowers for the next season are beginning to form within the bulbs.

Iris bulbs are never fully dormant, so they should never be out of the ground for a long period. They should be replanted in late summer or early autumn.

Soils for Bulbous Iris

Bulbous iris will grow in any good garden soil, but as many gardeners are still improving the soil in their gardens, they should aim to produce the best conditions for these irises. They require good drainage, no fresh organic matter, a soil that is not too acid, and adequate phosphates and potash.

Drainage is all important round the bulbs, and though it is sometimes recommended that sand should be placed round the bulbs, this planting area may become a sump for water if the surrounding soil is badly drained. It is better to improve the soil and drainage in the whole area before planting the bulbs, as few plants of any kind would flourish in poorly drained soil.

Before planting, the soil should be well cultivated and dressed with garden lime at 2 oz. to the square yard and a fertiliser dressing of:

Bone meal	4 parts
Sulphate of potash	1 part

at 4 oz. per square yard.

As the bulbs can be left in the soil for 2 or 3 years, the fertiliser dressing should be applied each autumn.

Types of Bulbous Iris

Bulbous iris can be divided into two main types, the dwarf reticulata group and the taller xiphium or Dutch iris group.

The reticulata irises are most attractive miniature winter- or spring-flowering plants which are ideal for rock gardens or narrow, raised borders. They can also be grown in pots for flowering in the house or an unheated greenhouse. They are quite hardy and in the warmer districts should be protected from the heat of the sun in late spring as the foliage matures.

As these irises are the first to flower, they should be planted early, in late January or early February, keeping about 1½ in. of soil above the tops of the bulbs. Species generally available are *Iris reticulata* (purple) and *Iris danfordiae* (yellow), but others are occasionally offered by specialist bulb or iris growers.

Iris Xiphium Group

The iris xiphium group contains all taller irises growing from 18 in. to 3 ft. They are the irises normally sold by florists, and by the selection of different types and varieties they will flower in the garden from July to late December. As the original species have been interbred, they are usually grouped into types such as Dutch iris and English iris.

Their main features can be summarised as follows:

Apart from *Iris tingitana* all these irises are very suitable for growing in a mixed flower border. They should be planted with 4 in. of soil above the top of the bulb. With their neat foliage they can be interplanted with dwarf, spreading, summer bedding plants that are normally shallow rooted. French marigolds, *Phlox drummondi*, dimorphotheca, and verbena could be used for this purpose.

The bulbs can be left in the ground for 2 or 3 years, and should eventually be lifted and divided when the foliage is yellow/brown in late summer. The English iris has a very short period between the ripening of the bulbs and the development of new roots, so that it should be lifted as soon as the foliage dries off.

If the bulbs are not to be replanted immediately, they should be dried off in a cool, airy place, not in full sun, and before storing they should be dusted with lindane dust, as aphids sometimes live on the bulbs, damaging the bulbs and spreading virus diseases. Routine pest and disease control should be carried out during the growing season.

Iris tingitana is a plant which causes heartburning among most gardeners. It flowers most irregularly and the cause has never been fully explained.

The most regular annual flowering is considered to be encouraged by planting large, healthy bulbs in well drained soil in a sunny position. The bulbs should be covered with only an inch of soil and the winter flowering is probably encouraged by adequate ripening of the bulb the previous season. The soil should be well limed before planting and the fertiliser dressing given annually in November before the foliage finally dies down. The flowers should be protected from severe frosts.

Before planting, the bulbs of all bulbous iris should be dipped in an organic mercury bulb dip or thiram wettable powder to control diseases carried on the bulbs.

Rhizomatous Iris

The great majority of irises grown in the garden are rhizomatous iris, varying in height from 6 in. to 4 ft. with either broad-petalled flowers or with narrow-petalled flowers like the bulbous iris; the various types flower from mid winter to late summer.

Though none is native to New Zealand, two species at least can be found growing in uncultivated ground as garden escapes. They are not noxious weeds, but should not be allowed to spread too freely.

A rhizome is thickened stem tissue which produces roots from the lower surface and leaves and flowers from the upper surface. A rhizome is not in itself a root and so should never be planted deeply. This is especially the case with irises, as many of the rhizomatous types flower best after warm weather in the previous season, as the rhizomes would have benefited from the warmth of the sun.

Types of Rhizomatous Iris

Rhizomatous types can be divided into three groups for garden planting:

(a) The tall and dwarf types for general garden use.

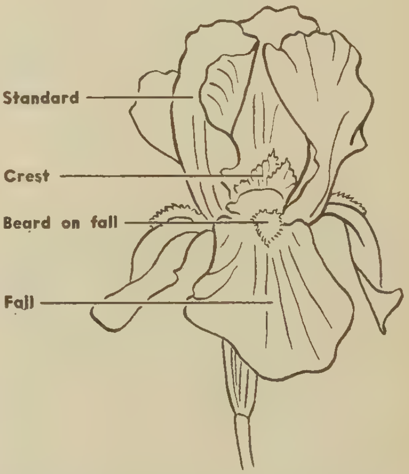
(b) Shade-loving types suitable for woodland planting.

(c) Water-loving types for moist soil and garden pools.

The requirements and management of these three groups differ, and it is important to realise which group each type belongs to, if the best results are to be obtained.

Tall Bearded Iris

Tall bearded iris is the so-called flag iris or German iris, once known as *Iris germanica*. The majority of these irises are hybrids between various



Details of the flower of a bearded iris. Iris flowers are so different from most other plants that the parts of the flower have been given special names. In catalogues and descriptions the colours of the standards and falls are usually described separately.

Latin name	English name	Time of flowering	Colours	Height ft.	Remarks
Iris tingitana	Tingitana iris	July to September	Blue	3	Flowers frost tender
Iris Wedgwood	Wedgwood iris	Early October	Blue	2½	
Iris xiphium hybrids	Dutch iris	October/November	Blue, yellow, white, bronze	2½	Leaves in autumn
Iris xiphium	Spanish iris	November	Blue, yellow, white	2	Flowers after Dutch iris
Iris xiphoides	English iris	December/January	Blue, purple	2	Leaves in spring

species and varieties, so these should now be called tall bearded irises. The name bearded iris is given because the three drooping petals (falls) have raised hair-like structures where they arch over (see the diagram on the opposite page).

Culture

Tall bearded irises are obtainable in nearly every colour except scarlet. They are tall and stately and so require some shelter in windy areas. They can be grown in beds by themselves or groups in a mixed border. They are best planted toward the back of the mixed border, as their flowering, though brilliant, is brief. They require a well drained soil in a sunny position. No animal manure is needed, but they benefit from an annual dressing in spring of garden lime and superphosphate, both applied at 2 oz. per square yard.

The rhizomes should preferably be planted or replanted immediately after flowering, even though they are in full growth; a slightly less suitable time is in March. They should not be planted in winter or mid summer, and established clumps should be lifted, divided, and replanted at least every 3 years.

This operation is quite simple, and is carried out by lightly forking the soil away from the roots and then inserting the fork right under the roots and rhizomes so that the complete clump is lifted. The oldest rhizomes may be discarded and the leaves on the younger rhizomes trimmed back before replanting. The roots should not be shortened, and the rhizomes should not be planted deeply.

The simplest method of planting is to draw the soil away to make a shallow saucer, place the rhizome on the edge of the saucer with the roots lying in the depression, and then bring the soil back over the roots. The soil should then be worked gently among the roots, and the rhizome should also be lightly covered with soil. As this consolidates, the top of the rhizome will eventually be at the correct level, just above the soil surface.

Dwarf Bearded Iris

There are now many varieties of dwarf bearded iris. These require the same treatment as the tall bearded iris. They are particularly suitable for edging a bed of tall iris, for planting in a rock garden, or in a narrow border with other small-leaved plants such as cacti or succulents.

Other Species

Iris fulva

Iris fulva and the related *Iris fulvala* are two species sometimes seen in gardens in New Zealand. *Iris fulva* has bright orange flowers and grows about 2½ ft. high. *Iris fulvala* is purple, about 18 in. tall. They can be grown in the same conditions as the bearded iris. Both are susceptible to the disease iris rust (*Puccinia iridis*), and as this is extremely difficult to control on irises with persistent foliage, it is best to remove and burn any infected plants. Iris rust also attacks bulbous iris and some Louisiana hybrids.

Iris innominata

A great variety of colours can be obtained from a mixed planting of *Iris innominata.* These are dwarf plants flowering in spring. The flowers are freely produced and are excellent for decorative work. The rhizomes are very short, so that a clump of these irises appears to be a tussock of coarse grass. They are best divided in autumn or early spring and should be grown in reasonably well drained soil.

They set seed very freely and stock can be increased by collecting the seed in late summer and sowing it in sandy soil in a seedbed. If the seedbed is specially prepared with sterilised soil or is watered with boiling water a few days before sowing, there will be little trouble from weeds subsequently. The seedlings can be planted into permanent positions as soon as they are about 2 in. high.

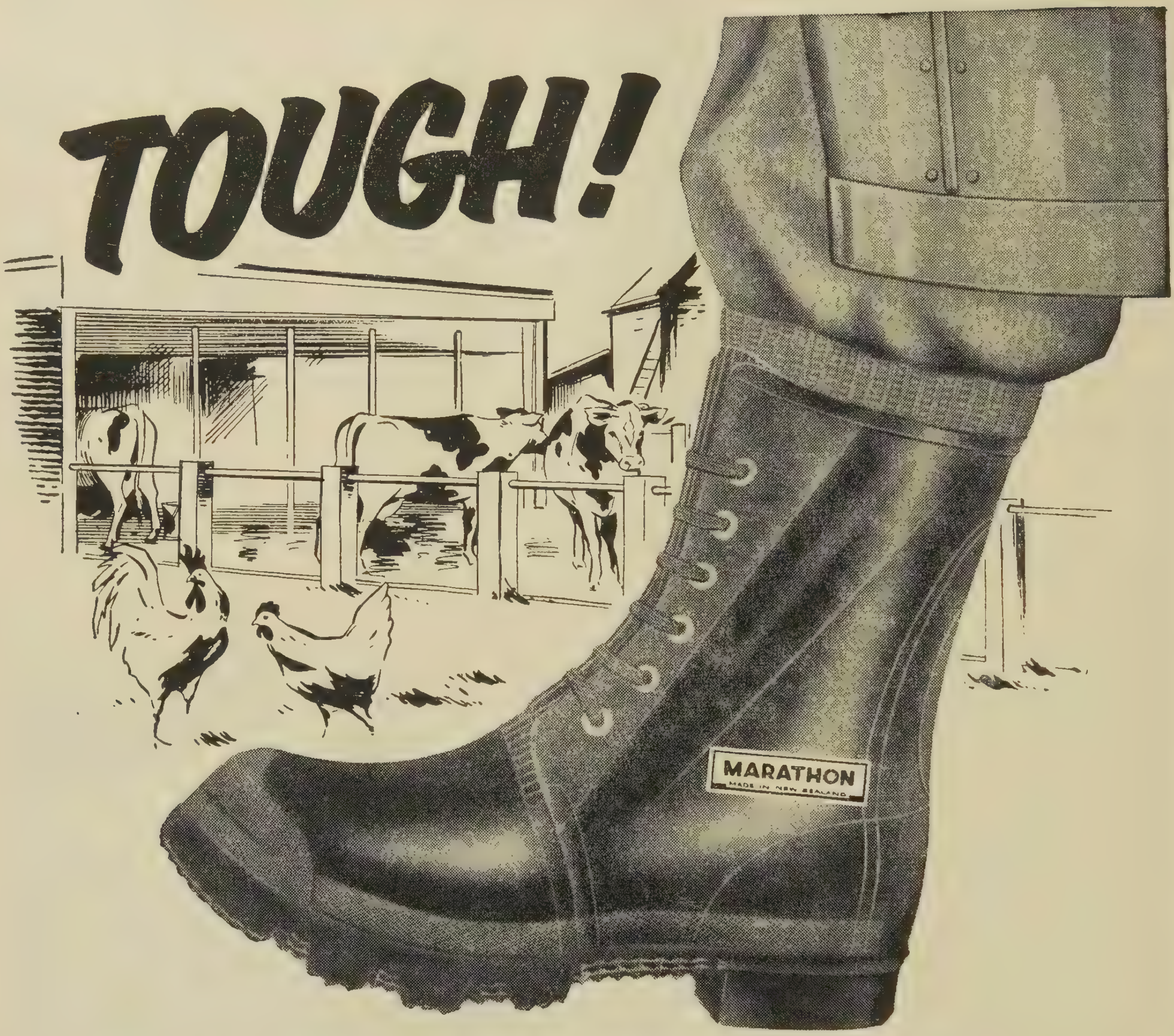
Occasionally clumps of *Iris innominata* will die off because of infection with various soilborne fungous diseases. These can be held in check by watering with copper oxychloride at 1 lb. to 10 gallons of water applied at 1 gallon per square yard.

Louisiana Hybrids

Though these plants or the parent species came from warm swampy areas of the United States of America, Louisiana irises can be grown in any rich garden soil. Unlike the bearded irises they do not require lime, but need full sunshine and a well manured soil. The majority of Louisiana hybrids are tall plants growing up to 5 ft., so they should not be planted in the front of a border. Unfortunately, some varieties are susceptible to iris rust, and infected plants should be destroyed as soon as the disease is seen. Other varieties appear to be resistant to this disease, which apparently has various strains, so that only certain varieties of iris become infected.

Dwarf bearded iris may be used as an edging for beds of tall bearded iris or may be grown in narrow beds on their own.

[Elliott



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Iris ochroleuca

Iris ochroleuca is a vigorous, very hardy iris with creamy yellow flowers in early summer. It is very suitable for growing in a herbaceous border, as the tall, upright foliage provides a contrast to other more rounded plants.

Iris unguicularis

The name *Iris unguicularis* now replaces the older more common name of *Iris stylosa*, the winter flowering iris. This is an essential plant for every garden, as the pale mauve flowers are freely produced all through winter. The flowers should be gathered by holding the base of the stalk between the fingers and pulling the flower stalk; a much shorter stalk is obtained if cut with scissors. Though the flowers do not last long when gathered, there are normally plenty available once the clumps start flowering.

The plants grow and flower best in a rich, limed soil, or even on a well prepared clay bank. The foliage is rather lank and untidy, so the old, brown leaves should be cut away in early autumn and the green leaves cut back slightly.

To prevent slugs damaging the buds in winter slug bait containing metaldehyde should be sprinkled round the clumps in autumn and winter.

The plants can be increased by division in autumn or spring, care being taken to choose the strong, young rhizomes with white roots from the outside of the older clumps.

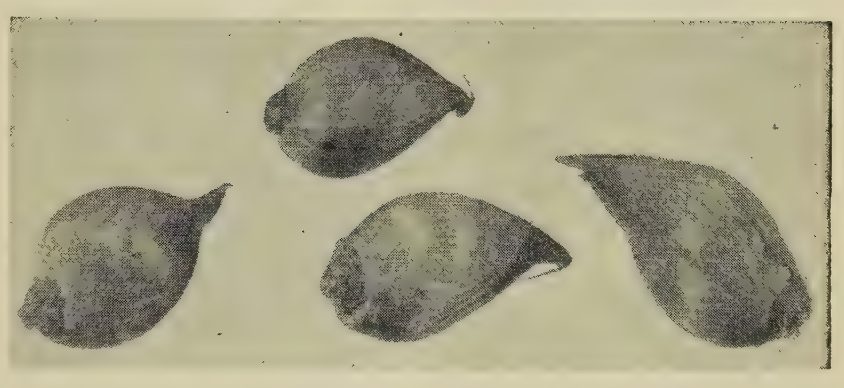
Shade-loving Irises

Two species of iris prefer shaded, open, woodland conditions. These are *Iris japonica* and *Iris watti.* Both make large clumps with broad, long, soft leaves. The flowers grow away from the main stalk and become rather flat so that they appear like blue stars with a yellow crest on the fall petals. They prefer light soils enriched with leaf mould from deciduous trees and flourish under the same conditions as woodland lilies or azaleas. Both can be propagated at any time of the year by the removal of rhizomes from the outside of the clumps.

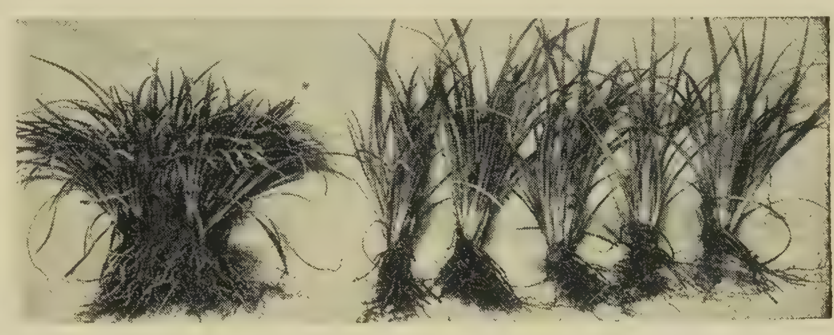
One other species, *Iris foetidissima*, can also be grown in shaded areas. This has rather insignificant flowers, but the seed pods open out to show brilliant scarlet seeds, which are most valuable for decorative work.

Moisture-loving Irises

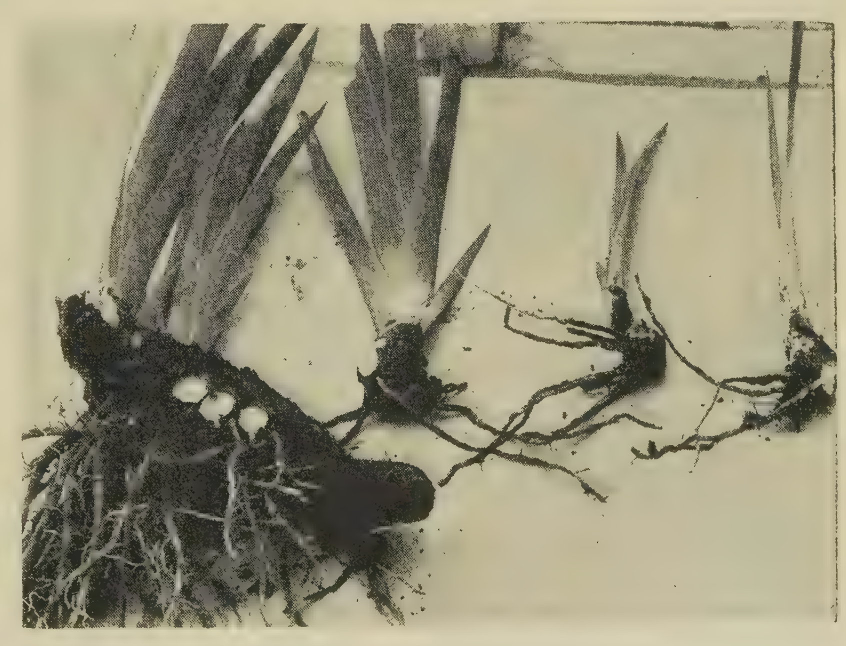
Several very attractive iris species and varieties grow best in moist soil. They are very suitable for planting along the edge of a garden pool, as their upright foliage gives height in contrast to the level surface of the water. *Iris kaempferi* and *I. laevigata* varieties can be planted actually in the water, but *I. sibirica* grows better where the roots are not actually submerged.



The bulbs of bulbous irises should be clean and firm when planted in early autumn.



Short, thick rhizomes of *Iris innominata* should also be divided in late spring after flowering or in early autumn; strong young clumps from the outside should be retained.



Rhizomatous irises are propagated by removing new, young rhizomes from the old ones immediately after flowering. Taller leaves are cut back slightly to prevent wind rocking the freshly set out plants.

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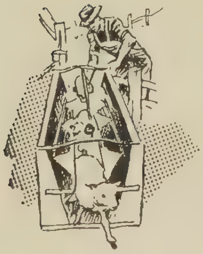

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I. kaempferi and its varieties are frequently called Japanese or Higo iris. They are strong-growing plants producing broad, flat flowers with blue, purple, or plum petals often veined with contrasting colour. There are both single and double forms. The rhizomes should be planted in autumn or early winter, as the leaves die down in winter and start to grow in spring before the new roots are produced. Many of these irises have been incorrectly called *I. laevigata*, but the latter has smooth, strap-like, thin leaves as compared with *I. kaempferi* and its varieties which produce thick, heavily ribbed leaves.

Varieties of *I. sibirica* are not grown as widely as they could be. They make neat clumps of narrow leaves, and the flowers are nicely in balance with the thin, wiry stems. Though they are suitable for the bog garden, they can also be grown in rich soil in the herbaceous border. They do not require lime. The leaves die down in autumn, so they should be cut back in the same way as most other herbaceous plants.

Pests and Diseases

Irises appear to suffer more from diseases than from pests. Some diseases are specific either to bulbous or rhizomatous iris; others attack all types of iris.

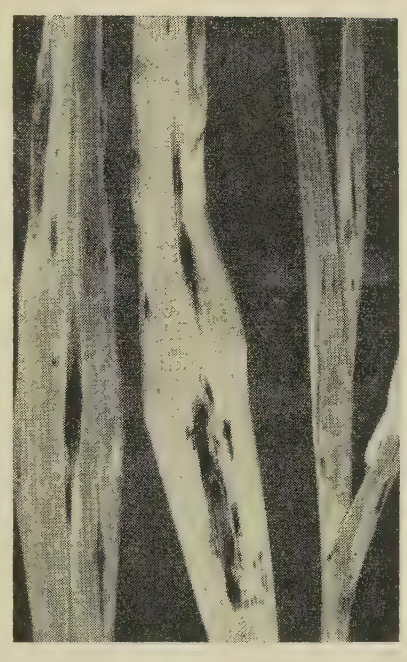
Diseases of Bulbous Iris

On the bulbs: As with all bulbous plants, the bulbs must be handled gently and not dropped, knocked, or left in full sunlight. Damaged bulbs frequently become covered with a green mould, *Penicillium* sp., which if left unchecked will cause the bulb to rot. The disease can be controlled by handling the bulbs carefully at all stages and by dipping the bulbs in organic mercury bulb dip (1 oz. to 2 gallons of water) or thiram wettable powder (80 per cent) at 1 oz. to 1 gallon of water.

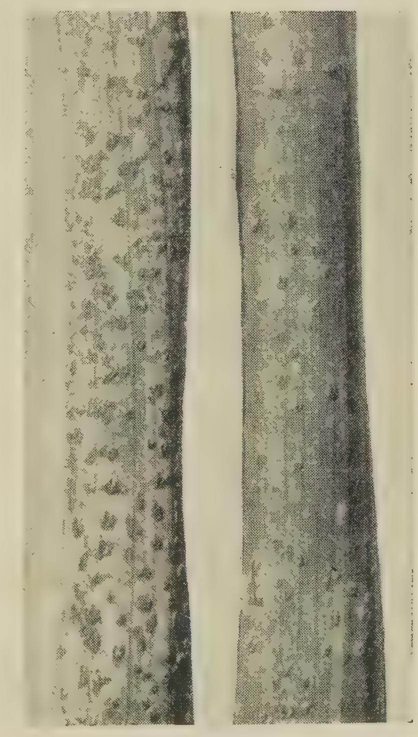
In poorly drained soils iris bulbs may rot away because of infection by either bacteria such as *Erwinia carotovora* or soil fungi such as *Sclerotium rolfsi*. These diseases cause the foliage to die prematurely and the bases of the leaves and the bulbs develop a soft, wet rot. In both cases there is no control once the bulbs are infected, but it is important to prevent these diseases by planting healthy bulbs in well drained, limed soil. Irises should not be replanted in areas where they have previously rotted.

On the leaves: Bulbous irises are susceptible to three damaging diseases, ink spot, leaf spot, and iris rust.

Ink spot disease (*Mystrosporium adustum*) produces large, black blotches on the leaves in late winter or early spring. It can be specially damaging where bulbs are left in the ground for more than a year and where the leaves were infected in the previous season. The disease can be controlled by spraying infected plants as soon as the disease is recognised with bordeaux mixture in the proportions of 3 : 4 : 50. To make 4 gallons of bordeaux mixture use 4 oz. of copper sulphate and 5 oz. of hydrated lime to 4 gallons of water. Bordeaux is apparently more satisfactory than copper oxychloride, as the latter does not stick so well to the upright, waxy leaves. The disease can persist on bulbs, especially those of the *I. reticulata* type.



Ink spot disease causes black lesions on the leaves of bulbous iris.



Iris rust produces raised orange or black pustules on the leaves of infected plants.

Bulbs from infected plants should be carefully cleaned of old scale leaves and the dead flower stalk and dipped in a fungicidal bulb dip.

Leaf spot disease is caused by the fungus *Didymellina macrospora* (*Heterosporium iridis*) which also attacks rhizomatous iris. It produces light brown spots on the leaves, frequently toward the tips, the spots gradually developing a grey centre. This disease can be controlled by spraying all infected irises with bordeaux mixture 3 : 4 : 50 or zineb at 1 oz. to 3 gallons of water. Hygiene is important and old leaves should be collected and burnt.

Iris rust, caused by the fungus *Puccinia iridis*, can be very damaging to bulbous iris. The disease produces orange-coloured raised pustules in spring and summer on the leaves and flower stalks which gradually dry up and flowering is spoilt. In winter, black raised pustules are formed, which superficially resemble ink spot, in all parts of the plant. Iris rust has also been found on some rhizomatous types, such as *I. fulva*, *I. fulvala*, some Louisiana hybrids, and a plant related to irises, *Hermodactylis tuberosa*, sometimes called *I. tuberosa*. As the disease can only be checked and not eradicated by spraying, infected plants should preferably be lifted and burnt. Very valuable infected stock can be sprayed repeatedly as a precautionary measure with bordeaux mixture or zineb, but complete destruction of infected material is preferable, as this disease is not yet widespread in New Zealand.

Virus Diseases

Many Dutch and Spanish iris varieties and some strains of *I. tingitana* are infected with the virus disease iris mosaic. This causes light streaks on the leaves and bud sheaths; the petals of blue, white, and bicoloured varieties may show streaks or dark spots of a tear-drop shape. Once bulbs are infected, the whole plant carries the virus disease, and all progeny bulbs are similarly infected. The disease is spread from plant to plant by aphids, either during the growing season or on bulbs in store.

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There is no control for this virus disease and severely infected stocks should be lifted and destroyed. When bulbs are being selected for replanting the clumps of small bulbs should always be rejected and only clumps of large bulbs and their progeny replanted. Aphids should be controlled during the growing season with insecticides such as lindane or malathion and the bulbs dusted, before storing, with lindane.

Pests of Bulbous Iris

Apart from aphids referred to previously, bulbous irises are not normally attacked by many pests. Bulbs may sometimes be attacked by the grubs of the lesser bulb fly (*Eumerus strigatus*). The adult flies which laid the eggs probably originated from an old-established planting of narcissus or similar bulbs. If these are found to be infected, the whole area should be drenched with aldrin emulsion.

Bulbs which have been kept in store too long or are damaged by fungal rots may also become infected with bulb mite (*Rhizoglyphus echinopus*). These are minute yellowish-white mites which live among the bulb scales, causing them to go brown and rot further. It is generally considered that these mites are secondary to some other trouble. Soft, infected bulbs should be destroyed and the reason for their entry into the bulbs investigated.

Diseases of Rhizomatous Iris

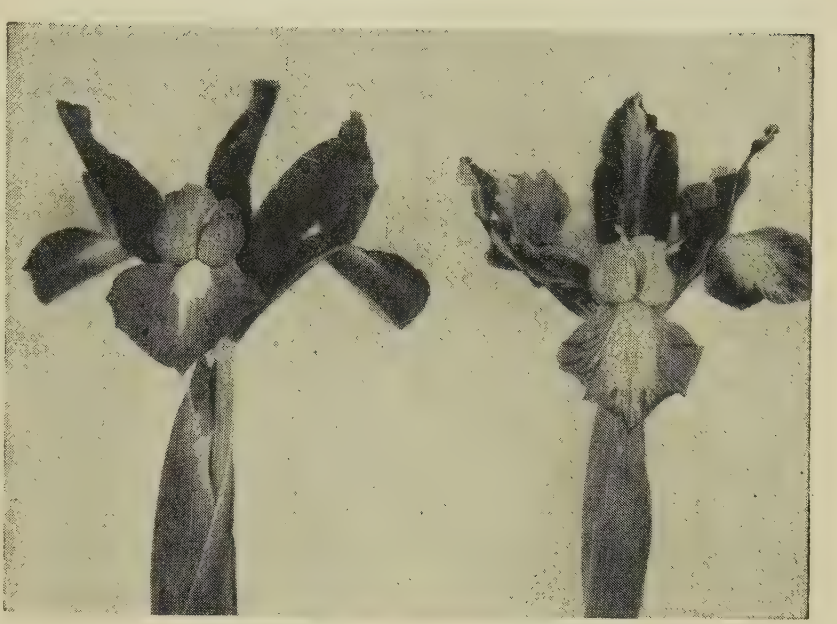
On the rhizome: Rhizomatous iris may be attacked by the same bacteria and fungi that cause rots in bulbous iris.

Bacterial rot causes a soft rotting of the rhizome, usually at the base of the fan of leaves. This normally occurs where the plants are grown in too rich and moist a soil and is seldom found where the rhizomes are fully exposed to the sun and grown in an average garden soil. Infected rhizomes should be lifted, at any time of the year, when infection is found, the diseased part cut away, and the exposed flesh dusted with a copper fungicide. They should then be replanted in fresh soil in a more suitable position.

The rhizome rot caused by the soil fungi *Sclerotium* spp. has a slightly different appearance. A rot develops at the base of the leaves and these fall away from the rhizome, the fungus produces white threads over the rhizome, and small resting bodies like mustard seed are formed in the threads. When diseased plants are seen, infected leaves should be removed and burnt and the whole area drenched with a fungicide such as copper oxychloride at 1 lb. to 10 gallons of water applied at 1 gallon per square yard.

On the leaves: Two leaf diseases attack dhizomatous iris, leaf spot (*Didymellina macrospora*) and a bacterial disease. *Bacterium tardicrescens.* Leaf spot has been described previously under bulbous iris. The bacterial disease causes round spots with a water-soaked centre and a dark brown stain from the tips of the leaves downward. Control should be obtained by cutting off diseased leaves and spraying the plant with a copper fungicide.

IRISES IN FLOWER GARDEN



Flowers from healthy (left) and virus infected (right) iris plants.

Iris rust will also attack certain varieties and should be dealt with as soon as seen.

Rhizomatous iris are remarkably free of pests, provided normal garden hygiene is maintained.

Work for December

In most gardens a wide range of plants will be forming flower buds and by Christmas time the flowering beds will be quite rewarding. Attention should be given to disbudding, where necessary, and to weed control, hoeing, watering, and the control of pests and diseases.

General Cultivation

The hoe should be lightly used among beds of annuals to kill weeds. Provided they are not seeding, such weeds can be used on the compost heap. Mulching with sawdust, spent hops, or thinly spread lawn clippings to depress weeds, conserve moisture, and keep the roots cool during summer is preferable to hoeing round the base of fibrous-rooted plants.

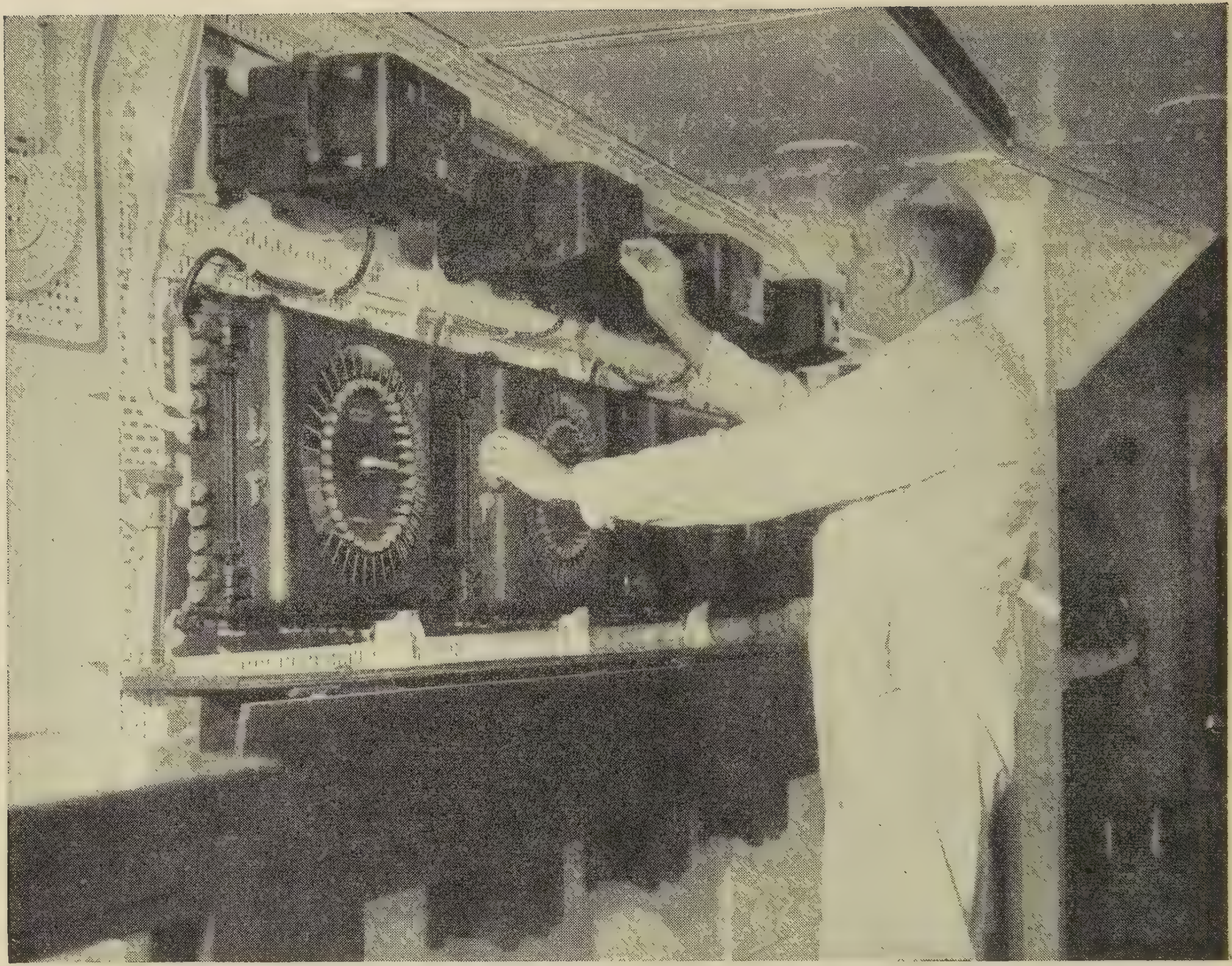
Delphiniums and Hollyhocks

If the main spike is removed as soon as it has finished flowering, some varieties of delphiniums will develop side shoots and others will grow a second flowering spike from the base of the plants. Fortnightly feedings with liquid manure will improve the flowering of these plants. It is wise to stake delphiniums even when planted in sheltered positions, as the brittle stems break very easily. Hollyhocks are not so brittle and need be staked only in windy positions.

Delphiniums, sweet peas, asters, and hydrangeas are all attacked by the powdery mildew fungus *Erysiphe polygoni.* A greyish-white mould appears in patches on affected plants and severely affected leaves may turn yellow and droop. The plants are generally weakened and sometimes do not reach the flowering stage. Badly damaged foliage should be burnt and the remainder of the plant sprayed with a mixture of:

3½ fl. oz. of lime sulphur
1½ oz. of colloidal sulphur
4 gallons of water

The newer spray "Karathane" is very effective against mildew and can be used at 1 oz. to 3 gallons of water.



Half a degree either way

Ships on the New Zealand run have just *got* to be refrigerated ships. Without them the trade in meat, cheese, butter, fruit and quick frozen vegetables, on which the Nation depends, would stop dead.

Refrigeration. . . . It sounds so easy. But have you ever thought what it really means in terms of design and space problems, not to mention money problems? Let's look at some of them.

The temperature must be right—absolutely right. Chilled meat is carried at 29½° F, with only ½° F. leeway in either direction; it can be carried at 29° F, it can be carried at 30° F, but not a fraction of a degree above or below.

Restrictions on other types of refrigerated products are rather less exact, frozen meat, for example, calling for a temperature of 14 or 15° F. The design must be right. Refrigerating plant takes up a lot of space with the mass of complicated machinery, insulating materials–both bulky and heavy – that there are. All these reduce the total cargo capacity.

Quick delivery is, of course, imperative, so that the trend is towards faster ships. Designers are producing them, but to be faster they must be slimmer and this reduces cargo capacity even more. . . .

This is one of the complications which the New Zealand Overseas Shipping Lines accept as everyday routine. The future is likely to bring even greater problems but, however complex these may be, they can be overcome when there is brought to bear upon them the combined skills which have solved so many shipping problems in the past. Co-ordinated organisation thus benefits everyone. It benefits you.

Issued in the interests of mutual understanding by

NEW ZEALAND OVERSEAS SHIPPING LINES

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The brown pustules of the rust fungus are often seen on hollyhocks. Burning of the first affected leaves and spraying the remainder of the plant with sulphur as for mildew or with zineb or copper sprays will help control this disease.

Liquid Manure

Many plants are now forming flower buds, and applications of liquid manure will improve the quality of the blooms. Liquid manure can be made by suspending a sugar bag of animal manure in a large drum. After a week this should be ready for use during the next month. A fresh batch should then be made. It should be diluted to the colour of weak tea and applied to the moist soil at 2 gallons per square yard.

Proprietary mixtures are now available for use as liquid manures. They can be sprayed on to the foliage itself, but should not be used stronger than the manufacturers' recommendations or damage may occur. Sulphate of ammonia used at ½ oz. to a gallon of water will give plants a boost, but should not be applied to the foliage or burning may occur. Liquid manures generally should be applied only when the soil is moist.

Plants in the Border

Plants in the border require attention at intervals to remove dead flower heads and stake the plants as they grow. Lupins, anchusa, doronicums, and others will throw more side blooms if the first blooms are removed as they fade. Seedling annuals should be thinned to 6 to 9 in. apart to allow them to develop. Large bushes of marguerite daisies, if cut well back now, will soon refurnish with young growths. Any remaining gaps can be filled with cannas, zinnias, salvias, or gladiolus corms. A few anemones could be planted now to begin blooming in late autumn.

Hosta undulata, an attractive perennial plant.

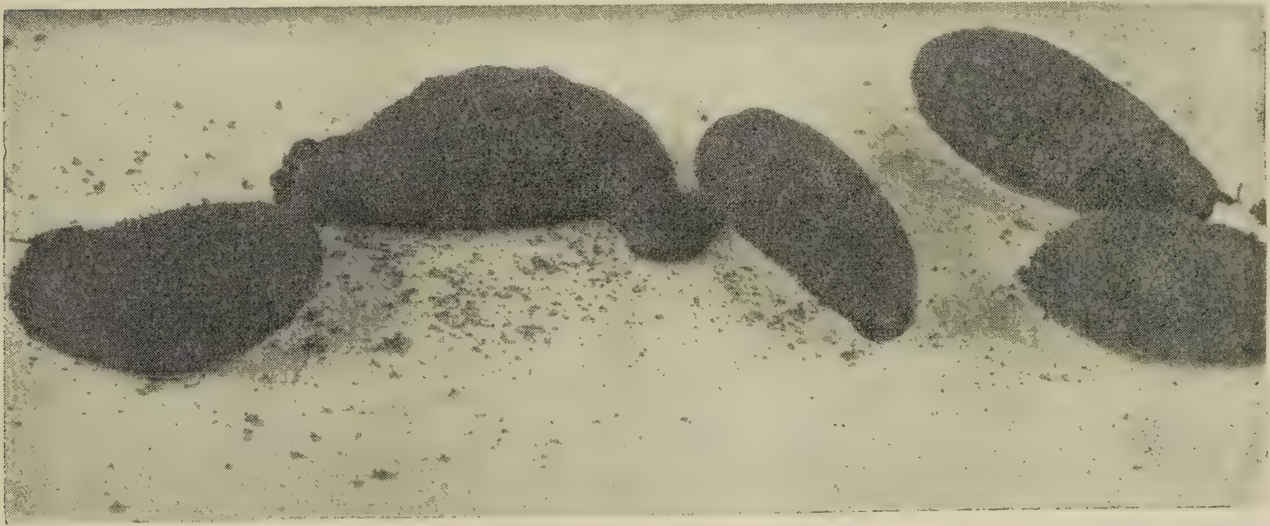
A wide range of pests and diseases attack many plants, aphids and caterpillars being two of the worst pests. Malathion, lindane, or nicotine sulphate can be used against the aphids, and DDT, arsenate of lead, lindane, or malathion will kill most caterpillars. Lindane and malathion are two of our most useful pesticides.

An attractive border plant which is rarely attacked by pests and diseases is *Hosta undulata.* It has well shaped green and white leaves, which have a striking effect in flower arrangements, and pale lilac flowers on a stem reaching a height of 2 ft. It is an excellent plant in moist and partially shaded positions.

More Pests

The leatherjacket is the larvae of the crane fly (daddy-longlegs) and will attack roots of garden plants. In this respect it is similar to grass-grubs and has been known to kill established shrubs. The treatment using DDT to control grass-grubs as described last month should kill the young leatherjackets as they hatch out in autumn.

The red spider mite is not easy to see with the naked eye, but on the undersides of leaves a very fine web may be seen covering the mite. It attacks violets, carnations, clematis, primroses, sweet peas, ivy, and hydrangeas, to mention a few. These mites increase most rapidly in hot, dry conditions and in positions where the air does not circulate freely. Growers of violets or primroses will be familiar with the pale, mottled appearance which the mite causes by sucking the sap from the leaves.



[*Webster*

Leatherjackets, the larvae of the crane fly, which are commonly known as daddy-longlegs, are shown here magnified two to three times their natural size.

Frequent hosing among plants with water will discourage this pest, but dusts of malathion, combined with captan dust to control leaf spotting, will keep the plants healthy throughout the season.

The pear or cherry slug will be active in some gardens now stripping the green tissue from the leaves of ornamental cherries, pears, prunus, and rowans. This slimy black slug can be controlled with DDT or by spraying the plants as soon as noticed with a spray of 3 level tablespoons of arsenate of lead to 4 gallons of water.

Dahlias and Chrysanthemums

Both dahlias and chrysanthemums will benefit from side dressings of balanced fertilisers or from liquid manure. If old clumps of dahlias have grown a thick clump of young shoots, these should be thinned immediately so that the remaining shoots will have space to develop. Plants developing with conspicuous rings of light green or yellow tissue on the leaves should be entirely removed and burnt to prevent the spread of the tomato spotted wilt virus which debilitates the plants. There is no control.

Chrysanthemums, except the pompone varieties, should be nipped back until the end of this month to induce a multiplication of flowering shoots. The sprays mentioned last month should be used regularly. Both dahlias and chrysanthemums should be securely but inconspicuously staked, especially in windy areas.

Roses

Spraying of roses as mentioned last month should be continued. Some rambling roses are particularly susceptible to mildew and when sulphur sprays cannot be used because of painted woodwork, the newer spray "Karathane" can be used. This spray should be applied on good drying days, but not in temperatures over 80 degrees F. When the ramblers have finished blooming the flowered branches should be removed and the young developing growths should be tied in place.

Mulches should be applied before the ground starts to dry out. Suitable materials are animal manures, spent hops, and sawdust. When roses are being picked the blooms should be cut back to immediately above a good bud with stems as long as possible. In the early part of the season blooms should be cut when half opened, but as the season becomes warmer they can be cut in a tighter bud.

Budding can be started as soon as the bark lifts readily.

Compost and Sawdust

Tulip fire caused by botrytis rot. If flowers were infected like this in spring, the bulbs should be carefully dug and burnt. Careful handling of all bulbs will reduce damage and help prevent the entry of botrytis fungus.

In many home gardens it is difficult to obtain ample supplies of animal manure, and compost is therefore greatly valued. All disease-free plant material and kitchen refuse such as coffee grounds and vegetable wastes should go straight to the compost heap. Heaps which are correctly made should give no concern from flies, but a spray or dusting of DDT will soon control any should they appear.

Sawdust has proved an excellent covering material for compost heaps and where the heap is built on a soil base can entirely replace the layers of soil normally recommended. Light dressings of blood and bone or lime should be given to alternate layers. If a heap of sawdust is placed near the heap, or in one of the compost bins, refuse can easily be kept covered and flies will not be attracted.

Lawn clippings are plentiful at this time and if lightly mixed with sawdust and added to the compost, will not form the solid, impenetrable layer which they do when used alone. An excellent compost can be made entirely from thoroughly mixed sawdust and lawn clippings which have been allowed to decompose. This mixture, which is a rich black colour, could be used where the appearance of a simple sawdust mulch is not appreciated.

If it is not possible to make your own compost, proprietary mixes are becoming available. These are better quality than many home-made composts.

Bulbs

The planting of gladiolus corms should be concluded this month. Developing flower buds should be encouraged with liquid feed or side dressings of balanced fertiliser. Heavy applications of fertiliser mixtures high in nitrogen may delay the blooming to some extent. Sprays of DDT emulsion against thrips should be continued.

Tulips can now be lifted, care being taken not to damage the bulbs and thus allow the entry of botrytis rot. The soil above narcissi, hyacinth, iris, and amaryllis, which can be lifted next month, should be either sprayed with DDT wettable powder twice at an interval of 2 weeks or cultivated to discourage egg laying by the narcissi bulb flies.

Nerines, except the most hardy one, *Nerine bowdeni*, can be transplanted this month as soon as the foliage dies down. They flower best if left undisturbed, and groups should be established in hot, sunny positions. Water should be withheld after planting the bulbs with their necks above the ground.

General

Cuttings of most succulent plants, including cacti, can be taken this month. They can be easily rooted by supporting them on a very light, sandy mixture. The ends of euphorbia cuttings should first be dipped in charcoal to stop the bleeding.

Climbing plants should be tied to their supports as they develop.

Sweet peas should be kept picked and given liquid fertiliser to improve flowering. Extremely dry or wet conditions may cause the buds to drop and these conditions should be avoided.

Fuchsias also appreciate liquid feeding and will respond to a dose of sulphate of ammonia at ½ oz. per gallon per plant. Plants should be checked for thrips, which can be controlled by spraying with DDT or dieldrin emulsions, and for mealy bugs, which can be controlled with malathion.

As the flowers of brooms fade the branches should be reduced to leave 2 to 3 in. of 1-year-old wood from which fresh young growth will develop.

The replanting of iris as mentioned in the accompanying article should be attended to immediately after flowering.

Lilies should be staked, mulched, and sprayed against aphids and botrytis.

Lawns can receive a 3-monthly dressing at 1 oz. per sq. yd. of a mixture of 3 parts of sulphate of ammonia and 1 part of superphosphate.

In the glasshouse cinerarias for spring blooming can be sown. Some freesias for early blooming may now be potted up. Begonias need special care to get the best blooms; faded flowers and seed pods should be removed and liquid feeding can be given.

Cleaning Upholstered Furniture

UPHOLSTERED furniture can usually be cleaned successfully in the home as long as the texture or colours of the material will not be affected by the cleaning agents. To minimise inconvenience in the household it is advisable to wash and dry one chair at a time, especially with furniture that is used every day. Methods of regular and complete cleaning of different kinds of upholstered furniture are described in this article.

A FABRIC-COVERED chair gathers just as much dust as a highly polished table, but because of its texture the dust is not as noticeable. For this reason woodwork is regularly dusted and cleaned and upholstery is often neglected. If all the surface dust is left on, it is rubbed into the fabric, which will become grubby long before it should.

To retain its clean appearance upholstery should be brushed with a stiff brush or cleaned with the brush attachment of the vacuum cleaner every few days. About once a week the special upholstery attachment should be used to clean right down round the seat.

The vacuum cleaner should not be used on down-filled cushions, as the feathers will be pulled through. Cushions should be brushed and fluffed up after the chairs have been cleaned.

By MARY HUNT,
formerly Home Science Instructor,
Department of Agriculture,
Christchurch

Treat Stains Promptly

Stains should be removed as soon as possible. If left, they may become impossible to remove and may affect the colour of the fabric. First consider the fabric and the colour and identify the stain. Knowing whether the fabric is washable or whether cleaning agents can be used on it is important. If in doubt, test an inconspicuous part of the chair to find out if the fabric or the colour will be affected.

Some of the more common stains can be removed by the following methods:

Grease: Use a solvent such as carbon tetrachloride. On fine materials or fugitive colours (that is, colours that might easily be washed out) it is better to use an absorbent such as fuller's earth, white talcum, or French chalk. Leave the absorbent on the spot until it becomes gummy, then brush it off. Repeat the process until the mark has been removed.

Tea and coffee: Rub glycerine into the fresh stain and leave it for at least an hour. Sponge off the glycerine with water and allow to dry. If a grease spot remains, clean with carbon tetrachloride.

Alcoholic drinks: An absorbent such as those used for grease may remove a fresh stain. Another method is to sponge the stain with water and then rub in glycerine. Leave the stain for at least 30 minutes and sponge off.

Chocolate or cocoa: Scrape off as much of the chocolate as possible. Remove the grease in the stain with carbon tetrachloride, allow the spot to dry, and then sponge it with warm water.

Blue ink must be removed immediately. To the moist stain apply an absorbent such as French chalk, fuller's earth, or white talcum powder. Work it in and brush it off as it becomes stained. Repeat the action several times until no more ink is absorbed and then apply the absorbent mixed to a paste with water. Leave it until dry and brush off.

Complete Cleaning

Before washing upholstery, brush or vacuum clean it thoroughly to remove all the surface dust. Clean with a soap lather made by dissolving ½ cup of soft soap in 1 quart of boiling water, adding a little water softener if necessary. Allow the mixture to cool until it jells, then beat it thoroughly with an egg beater until the foam becomes stiff.

Use only the lather on the chair, as the fabric should absorb as little moisture as possible. Gently work a little lather into the chair with a soft brush, cleaning only a small area at a time. Do not rub hard, as the texture of the material or the colour may be affected. Wipe off the soap with a soft cloth wrung out in clean, warm water.

After being washed linen and chintz slip covers need all-over ironing, which can be best done when the cover is in place. The valance has to be ironed while damp and before the cover is replaced.

Continue washing a small area at a time, making sure to start within the previous area cleaned so as not to leave dirty marks. Change the rinsing water often.

Dry the chair as quickly as possible in a draught or by an electric fan, but not in the direct sun or in front of the fire. The chair must not be used until it is absolutely dry.

Before washing the chair in this way the fabric should be tested on an inconspicuous part of the chair for any effect on colour or texture. This method of cleaning is not suitable for velvet or some pile fabrics, but most other materials such as linen, tapestry, denim, or repp can be successfully cleaned. Dry cleaning agents can be used on velvets and the pile can be revived by steaming.

Upholstered latex foam or sponge rubber chairs can be washed with soap and water in the same way as other upholstery. The use of grease solvents or petrol should be avoided, as they may damage the rubber.

Leather-upholstered Furniture

Leather should be protected as much as possible from excessive heat or damp. Dust leather frequently and wash it whenever necessary. Wiping with a soft, damp cloth may be sufficient; otherwise the use of a special leather soap or thick suds made from mild, pure soap is recommended. Use as little water as possible. Wipe off the soap with a clean, damp cloth and when the leather is thoroughly dry polish it with a soft, dry cloth.

Upholstery leather does not require as much lubrication as shoe leather, but can be reconditioned occasionally with a commercial leather cleaner or with milk, which is very suitable because of its fat and casein content, the latter forming a protective film. The milk should be diluted with water, 1 part of milk to 2 parts of water. A good method is to wipe over the surface of the leather with the milk, rub it well in, and when the leather is dry polish it well. Oils tends to darken light-coloured leather, so it is best to use a white conditioner or white petroleum jelly. Mineral oil or wax should never be used on leather.

Imitation leather needs to be treated with even greater care than real leather, as it is not as serviceable. It can be cleaned in the same way as real leather. An excellent way to clean and improve the surface of imitation leather is to rub in stiffly beaten egg white with a cloth. Polish with another clean, soft cloth.

Plastic-covered Furniture

Dust plastic-covered furniture regularly. A damp cloth is usually sufficient to remove surface dirt. If the plastic is very dirty, it can be washed with mild soap or detergent and warm water. Rinse with a clean, damp cloth and rub dry. Chemical cleaners should not be used on plastic.

Loose Covers

Before washing loose covers, make absolutely sure that the material is colour-fast, washable, and that it has been pre-shrunk or that allowance has been made for shrinkage. Otherwise it is advisable to have them dry cleaned.

Before starting to wash the covers, shake them well and brush along the seams. They can be washed by hand, but as they are very heavy and cumbersome to wash successfully this way, it is preferable to use a washing machine.

If the cover is very soiled, the dirt can be loosened by soaking the cover in a solution of 1½ oz. of borax to 1 gallon of water. Then wash it in warm water and thick suds made with mild soap. Use water softener if necessary.

For hand washing plunge the cover up and down in the water. Repeat this process with fresh suds. Heavily soiled parts such as the arms or headrest can be scrubbed gently with a soft nail brush. Do not put the cover through the wringer, but squeeze out the water without twisting the fabric. Rinse several times in clean lukewarm water. If using a washing machine, run it for 5 minutes, then if necessary run it for 3 minutes in fresh, soapy water. Rinse thoroughly and partially dry the cover in the shade or indoors away from any source of heat.

Iron the valance while the material is still damp and then replace the cover on the chair and allow it to complete drying. Most materials will require only to be touched up with the iron, with the cover left on the chair, but linen and chintz may require all-over ironing.

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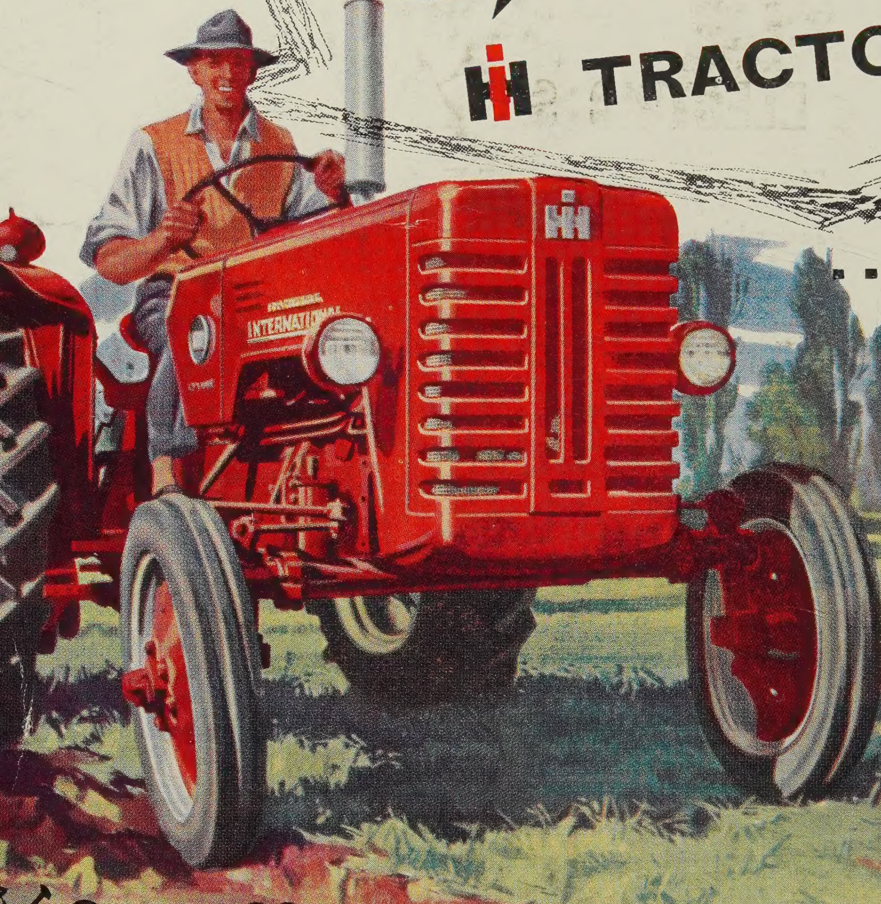

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